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July 21, 2016

VIA E-MAIL (COURTESY COPY TO FOLLOW BY U.S. MAIL)

Virginia Department of Environmental Quality
Piedmont Regional Office
c/o Joseph Bryan
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Glen Allen, VA 23060
E-mail: ChesterfieldPowerStationWaterPermit@deq.virginia.gov

Re: Final Comments on Draft VPDES Permit No. VA0004146, Dominion Chesterfield Power Station

Dear Mr. Bryan,

The Southern Environmental Law Center ("SELC") writes to submit comments on behalf of itself and the James River Association ("JRA") on the Draft Virginia Pollution Discharge Elimination System ("VPDES") Permit for the Dominion Chesterfield Power Station ("Draft Permit"). We ask that these comments and all attachments be made part of the Administrative Record.[1]

This coal-fired power plant is located on the James River adjacent to the Dutch Gap Conservation Area, which is a popular recreational area that is heavily visited and used for fishing, hiking, boating and camping.[2] The James River in the area of the Chesterfield Power Station is also a sensitive waterway that provides one of the few known spawning areas of the Chesapeake Bay Distinct Population Segment of the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), a federally-listed endangered species. The draft permit proposes to authorize the release of impounded wastewater ("dewatering") from two legacy coal ash ponds (the "Upper Ash Pond" and "Lower Ash Pond") with limits set far in excess of applicable water quality standards. Moreover, the dewatering limits in the Draft Permit do not reflect concentrations that available technology can achieve, and, in fact, is being achieved at Dominion's Bremo and

[1] Except to the extent inconsistent with the comments herein, we incorporate by reference the comments submitted by the Chesapeake Bay Foundation (submitted by Margaret L. Sanner) and Sierra Club (submitted by Lane Johnson).

[2] *See* Attachment 3, Chesterfield County, Parks and Recreation, Dutch Gap Conservation Area – Outdoor Programs.

Possum Point sites. The permit also allows an excessive time period of up to six years before toxic waste streams have to comply with EPA's recently promulgated Effluent Limitation Guidelines (ELGs) for Steam Electric Power Plants.[3] Under this rule, DEQ must apply these new guidelines "as soon as possible beginning November 1, 2018."[4]

In addition, the Draft Permit also relies on a 12-year old study in support of a thermal variance under Section 316(a) of the Clean Water Act ("CWA"). This thermal variance requires reevaluation, and the amount of hot wastewater that may be discharged must be lowered, particularly in light of the recently discovered population of spawning Atlantic Sturgeon in the immediate vicinity of the plant.

The authorized intake of cooling water under Section 316(b) of the CWA also poses a threat to the Atlantic Sturgeon and other aquatic life. In fact, two sturgeon larvae were confirmed to have been entrained at the CPS in October 2015. Dominion has some technology in place to reduce impingement/entrainment mortality, but the on/off nature of the intake pumps means that flow cannot be varied other than by taking a unit offline. Other solutions, such as a closed-cycle recirculating system, have gone unconsidered, and could resolve many of the concerns posed by the 316(a) and 316(b) portions of the Draft permit.

As proposed, the concentration limits and thermal variance in the Draft Permit violate the Clean Water Act. The Draft Permit ignores available treatment technology in setting concentration limits, allows Dominion to discharge cooling water at exceedingly high temperatures without any effective limit, and presents a risk to the threatened and endangered species of the James River, including the endangered Atlantic sturgeon. In formulating concentration limits, the Draft Permit relies on dilution, allowing pollutants at concentrations above state standards to be discharged to Farrar Gut and the James River.

The Draft Permit also does not require sufficiently stringent monitoring of permitted discharges; does not adequately protect the existing uses of Farrar Gut and the James River; and fails to account for the impacts of sea level rise and flooding on the Chesterfield Power Station and the coal ash stored there. The Draft Permit also refers to groundwater monitoring due to contamination of groundwater at the site by the Upper and Lower Ash Ponds and the metals waste cleaning pond, but does not require an assessment of corrective action alternatives before closure of the ash ponds may proceed.

I. GENERAL COMMENTS

A. The James River and Surrounding Area

The Chesterfield Power Station ("CPS") is located within the James River Oxbows section of the Captain John Smith Chesapeake National Historic Trail, an area that is frequented by approximately 145,000 children and adults every year. This area includes the Dutch Gap Conservation Area, Henricus Historical Park (a reconstruction of the second oldest English

[3] *See* Attachment 30, 80 Fed. Reg. 67,838 (Nov. 3, 2015).

[4] *Id.* at 67,854.

settlement), and Presquile National Wildlife Refuge. Visitors to this area partake in numerous boating, fishing, historical, and other recreational activities in the lands and waters directly adjacent to CPS.[5]

In particular, the CPS is located directly adjacent to the Dutch Gap Conservation Area, an approximately 800-acre recreational and natural area known for its boating, fishing, hiking, biking, horseback riding, camping, and nature viewing.[6] The northern section of the Dutch Gap Conservation Area is surrounded on the northern side by the James River, on the western side by the CPS's large coal pile and Lower Ash Pond, and on the southern-most side, by the Upper Ash Pond. This triangularly-shaped portion of conservation area also includes the Dutch Gap Boat Landing, a public boat launch, which is located on the James River only several hundred yards downstream of CPS Outfalls 001 and 002.[7]

The southern section of the conservation area is surrounded by Farrar Gut, *i.e.*, the "Old River Channel," and to the north, by both the Upper and Lower Ash Ponds. In fact, the Upper Ash Pond is wedged directly in between the two sections of the Dutch Gap Conservation Area. This section also encompasses the Tidal Lagoon, which is a lagoon that is fed by Farrar Gut and is also directly adjacent to the Upper and Lower Ash Ponds.

The Upper and Lower Ash Ponds are directly adjacent to the surface waters used by visitors to the Dutch Gap Conservation Area, including Farrar Gut and the Tidal Lagoon fed by Farrar Gut. Outfall 005 from the CPS Upper Ash Pond discharges to Farrar Gut directly next to a dock and designated fishing access point, within the Dutch Gap Conservation Area. A large portion of the loop trail at Dutch Gap tracks the perimeters of both the Upper and Lower Ash Ponds, and passes right by Outfall 004 from the Lower Ash Pond into Farrar Gut. The Long Point Trail gives visitors access to a small isthmus out into Farrar Gut, located just several hundred yards from Outfall 003, which discharges hot wastewater (as hot as 129º F)[8] into Farrar Gut. The Oxbow Point Spur Trail provides visitors fishing access approximately a half mile down Farrar Gut from Outfall 003.[9]

Altogether, the Dutch Gap Conservation Area contains 5.8 miles of trails. Visitors are encouraged to fish throughout the conservation area and paddle the 2.5 mile Lagoon Water Trail. The Dutch Gap Conservation Area includes numerous trails, wetlands, docks, viewing points, kayak routes, and fishing access points.[10] Chesterfield County also offers numerous nature

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[5] Attachment 1, National Park Service, U.S. Dep't of the Interior, Making the Trail Visible and Visitor Ready: Progress on the James River Segment (Dec. 2013).

[6] Attachment 2, Nature Programs, Dutch Gap; Attachment 3, Chesterfield County, Parks and Recreation, Dutch Gap Conservation Area – Outdoor Programs; Attachment 4, Chesterfield County, Parks and Recreation, Dutch Gap Conservation Area & Dutch Gap Boat Landing Map.

[7] Attachment 4, Dutch Gap Conservation Area & Dutch Gap Boat Landing Map.

[8] Draft Permit Fact Sheet, Attachment 4.a.

[9] Attachment 4, Dutch Gap Conservation Area & Dutch Gap Boat Landing Map.

[10] *Id.*

programs for visitors to Dutch Gap, including family kayak tours and nature walks for children as young as 5 years of age.[11] At least one outfitter is offering paddle board lessons and excursions at Dutch Gap.[12] Visitors also swim in the surrounding waters, even in Farrar Gut where the water is heated by Outfall 003 and where there is a rope swing.[13] The Dutch Gap Conservation Area also includes the popular Henricus Historical Park, which receives the bulk of the 145,000 annual visitors to the James River Oxbows section of the Chesapeake Historic Trail,[14] and which is also abutted by the Chesterfield upper ash pond. In recent years, the Dutch Gap area of the James River has also been frequented by boat operators providing river tours for viewing sturgeon during the fall spawning period.[15]

In sum, the waters that the CPS discharges to—the James River and Farrar Gut, as well as the Tidal Lagoon fed by Farrar Gut—are used frequently by recreationists and other members of the public for fishing, boating, and nature viewing. These activities occur in extremely close proximity to the CPS Outfalls 001 and 002 on the James River, and Outfalls 003, 004, and 005 in Farrar Gut. Likewise, the land directly adjacent to the CPS within the Dutch Gap Conservation Area and Henricus Historical Park is also used frequently for hiking, biking, nature viewing, and educational purposes. Again, these uses occur directly adjacent to the CPS and directly next to CPS outfalls and the Upper and Lower Ash Ponds.[16]

There is also a drinking water supply located approximately 10 miles downstream from the CPS at Hopewell, Virginia, where the Appomattox River joins the James River. Approximately 21 million gallons of water pass through the intake system every day in order to serve the 9,300 residential, commercial, and industrial customers.[17]

B. Atlantic Sturgeon

On February 6, 2012, following public comment, the National Oceanic and Atmospheric Administration ("NOAA") listed several Distinct Population Segments ("DPS") of the Atlantic

[11] Attachment 2, Nature Programs, Dutch Gap.

[12] Attachment 5, Black Dog Paddle (offering paddleboard lessons, tours, and rentals at Dutch Gap).

[13] Attachment 6, Mark Fausz, *Health concerns around Dominion flyash permit*, Village News Online (July 13, 2016).

[14] Attachment 1, National Park Service, U.S. Dep't of the Interior, Making the Trail Visible and Visitor Ready: Progress on the James River Segment (Dec. 2013).

[15] Attachment 7. Hunter Reardon, *Out of the Depths*, Richmond Magazine (Feb. 26, 2014).

[16] Attachment 4, Dutch Gap Conservation Area & Dutch Gap Boat Landing Map; Attachment 8, Hopewell Virginia System, Virginia American Water.

[17] Attachment 9, Chesterfield Power Station and Facility Graphic, James River Association; Attachment 8, Hopewell Virginia System, Virginia American Water.

sturgeon as endangered species under the Endangered Species Act.[18] Pursuant to this listing, the Chesapeake Bay DPS of the Atlantic sturgeon became an endangered species. As described by NOAA, there had been "increased sightings and captures of Atlantic sturgeon in the James River, which comprises the only known spawning river for the [Chesapeake Bay] DPS."[19] NOAA acknowledged that there was not enough evidence to confirm an increased abundance of Atlantic sturgeon in the James River, but noted that the increased sightings may be in part due to an improvement in water quality following the passage of the CWA. Despite the possibility of increasing population, NOAA explained that there remained "significant threats" to the Chesapeake Bay DPS of the Atlantic sturgeon from persistent degraded water quality and habitat impacts.[20]

NOAA also explained that while there is evidence that Atlantic sturgeon currently spawn in the James River, spawning locations are limited:

> Past removal of granite outcroppings and dredging of the James River likely represented the most significant impacts to spawning habitat in the CB DPS. Maintenance dredging and current dredging projects underway to deepen and widen the shipping terminal near Richmond on the James River have the potential to take Atlantic sturgeon in the river. The Commonwealth of Virginia does impose a dredging moratorium during the anadromous spawning season.
>
> The placement of turbine structures to generate power in rivers used by Atlantic sturgeon could directly take fish by blade strike or could, potentially, damage or destroy bottom habitat . . .
>
> With respect to the CB DPS, the period of Atlantic sturgeon population decline and low abundance in the Chesapeake Bay corresponds to a period of poor water quality caused by increased nutrient loading and increased frequency of hypoxia. USEPA's Third Coastal Condition Report identified the water quality for the Chesapeake Bay and immediate vicinity (to the Virginia—North Carolina border) as fair to poor. Water quality concerns (especially

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[18] Attachment 10, Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region, 77 Fed. Reg. 5880 (Feb. 6, 2012).

[19] *Id.* at 5883.

[20] *Id.*; *see also* Attachment 11, Endangered Species Act Section 7 Consultation: Programmatic Biological Opinion on the U.S. Environmental Protection Agency's Issuance and Implementation of the Final Regulations, Section 316(b) of the Clean Water Act, Appendix C: Additional Species Specific Effects Analysis for Species Under Jurisdiction of NMFS, at 46 (May 19, 2014) (Effects on Sturgeon from Cooling Water intake Structures likely to include "impingement or entrainment, thermal discharges, chemical discharges, and the indirect effect of prey and habitat reduction").

> low dissolved oxygen resulting from nutrient loading) and the availability of clean, hard substrate for attachment of demersal, adhesive eggs appear to be limiting habitat requirements in the CB DPS.
>
> Potential changes in water quality as a result of global climate change (temperature, salinity, dissolved oxygen, contaminants, etc.) in rivers and coastal waters inhabited by Atlantic sturgeon will likely affect those riverine populations. Effects are expected to be more severe for those riverine populations that occur at the southern extreme of the sturgeon's range, and in areas that are already subject to poor water quality as a result of eutrophication.[21]

On June 3, 2016, NOAA proposed designating a large portion of the James River as critical habitat for the Atlantic sturgeon.[22] The proposed critical habitat stretches from Bosher's Dam (a few miles upstream of Richmond), all the way to the Chesapeake Bay, and encompasses the stretch of the James River adjacent to the CPS. The proposal remains open for public comment until September 1, 2016. The critical habitat proposal acknowledged that additional research, subsequent to the 2012 endangered species designation, has shown that:

> Adult Atlantic sturgeon enter the James River in the spring, with at least some eventually moving as far upstream as Richmond (river kilometer 155), which is also the head-of-tide and close to the likely upstream extent of Atlantic sturgeon in the river, given the presence of Bosher's Dam at the fall line (approximately river kilometer 160). Adults disperse through downriver sites and begin to move out of the river in late September to early October, occupy only lower river sites by November, and are undetected on tracking arrays in the lower river by December, suggesting that the sturgeon leave the river for the winter.
>
> The availability of hard-bottom habitat remains relatively limited in the James River and appears to be significantly reduced compared to the amount of available hard-bottom habitat described in historic records. In general, tracked adults occurred further upstream during the late summer and early fall residency (e.g., river kilometer 108 to river kilometer 132) than during the spring and early summer residency (e.g., river kilometer 29 to river

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[21] Attachment 10, Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region, 77 Fed. Reg. 5880, 5906 (Feb. 6, 2012) (citations omitted).

[22] Attachment 12, Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon, 81 Fed. Reg. 35,701 (proposed June 3, 2016).

> kilometer 108), suggesting two different spawning areas depending on season.[23]

Atlantic sturgeon generally live their adult lives in marine waters, but spawn in freshwater regions. The Chesapeake DPS spawn in tidal freshwater regions, including the James River. Spawning migrations are cued by temperature. In the Chesapeake DPS, research has confirmed two spawning migrations, one in the spring and one in the fall, with the fall spawning migration generally occurring further upstream than the spring migration.[24] Using telemetry tags placed on Atlantic sturgeon in 2012, 2013, and 2014, researchers tracked the movements of sturgeon on the James River. The Atlantic sturgeon migrated as far upstream as 142 river kilometer and 155 river kilometer.[25] By comparison the CPS is located at approximately river kilometer 132.

In particular, researchers followed one tagged female and analyzed her movements along the James River. The female staged in brackish water, but made two suspected spawning runs in early and late September. The female sturgeon's second spawning run peaked at river kilometer 132, in the immediate vicinity of the CPS.[26]

This research makes clear that Atlantic sturgeon are present in the waters immediately adjacent to the CPS. This finding is further confirmed by numerous publications.[27]

Spawning populations in the Chesapeake DPS "have been drastically reduced due to overfishing, pollution, dam construction and habitat degradation."[28] Atlantic sturgeon eggs are very sensitive to temperature and oxygen content, and in addition, Atlantic sturgeon require hard

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[23] *Id.* at 35,706.

[24] Attachment 13, M. Balazik et al., *Empirical Evidence of Fall Spawning by Atlantic Sturgeon in the James River, Virginia*, Transactions of the American Fisheries Society, 141:6, 1465-1471 (Oct. 1, 2012); Attachment 14, M. Balazik & J. Musick, *Dual Annual Spawning Races in Atlantic Sturgeon*, PLOS One (May 28, 2015).

[25] Attachment 14, M. Balazik & J. Musick, *Dual Annual Spawning Races in Atlantic Sturgeon*, PLOS One (May 28, 2015).

[26] *Id.*, Figure 3 and pp. 6-8.

[27] Attachment 15, R. Springston, *12-foot sturgeons possible in James River, scientist says*, Richmond Times-Dispatch (Sept. 28, 2013) (describing sightings and live fish tracking of Atlantic sturgeon as far upstream as the Mayo Bridge in downtown Richmond); Attachment 16, M. Balazik et al., *The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia,* N. Am. J. of Fisheries Mgmt. 32:1062-69 (Oct. 15, 2012).

[28] Attachment 17, D. M. Bilkovic et al., *Atlantic Sturgeon Spawning Habitat on the James River, Virginia,* Final Report to NOAA / NOAA Chesapeake Bay Office, Virginia Institute of Marine Science, Center for Coastal Resources Management (Feb. 2009).

substrate.[29] In fact, "[t]he location of reaches of hard bottom benthic habitat" is a "probable limiting factor for successful spawning."[30] As described in one book:

> Substrate is a key habitat parameter for Atlantic sturgeon, because a hard bottom substrate is required for successful egg attachment and incubation. Within rivers, the areas of cobble-gravel, coarse sand, and bedrock outcrops, which occur in the rapids complex, may be considered prime habitat . . . South of the Chesapeake Bay, nearly all rivers have extensive rapid-complex habitats in and/or near the fall line zone; these areas are generally at least 100 km upstream form the saltwater interface. This habitat provides Atlantic sturgeon with well-oxygenated water, clean substrates for egg adhesion, crevices that serve as shelter for post-hatch larvae, and macroinvertebrates for food . . .
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> Some researchers have attempted to identify likely spawning areas for Atlantic sturgeon using modeling techniques. Brownell et al. (2001 developed a Habitat Suitability Index (HSI) model for spawning Atlantic sturgeon and early egg development, and found that cobble/gravel (64 mm to 250 mm) was the optimal spawning substrate for Atlantic sturgeon . . .
>
> Atlantic sturgeon reportedly spawn in waters where temperatures range from 13º C to 26º C. Temperature appears to be a universal determining factor in spawning migration times. Migration temperatures seem to be fairly uniform across the Atlantic Coast, with southern fish migrating earlier in the spring, and northern fish following a few weeks later once the waters reach the appropriate temperature. Generally, male Atlantic sturgeon commence upstream migration when waters reach around 6° C. Females usually follow a few weeks later when temperatures are closer to 12° C or 13° C. Spawning has been found to occur most often in waters 13° C to 21° C. In addition, Mohler (2003) stated in the "Culture Manual for Atlantic Sturgeon" that the preferred

[29] Attachment 18, Atlantic Sturgeon (Ch. 8), *Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs*, Atlantic States Marine Fisheries Commission (Jan. 2009).

[30] Attachment 17, D. M. Bilkovic et al., *Atlantic Sturgeon Spawning Habitat on the James River, Virginia*, Final Report to NOAA / NOAA Chesapeake Bay Office, Virginia Institute of Marine Science, Center for Coastal Resources Management (Feb. 2009).

> temperature for induced spawning in cultured sturgeons is between 20° C and 21° C.[31]

The critical importance of hard substrate has been reiterated in NOAA's proposed critical habitat designation of the James River. In the proposed critical habitat designation, NOAA explained that all Atlantic sturgeon "spawn in freshwater over hard bottom substrate."[32] 81 Fed. Reg. 107 at 35,703. "Spawning sites are well-oxygenated areas with flowing water ranging in temperature from 13º C to 26º C, and hard bottom substrate such as cobble, coarse sand, hard clay, and bedrock."[33]

In addition to being critical factors for spawning, temperature and oxygen levels are also important factors for juvenile Atlantic sturgeon:

> Temperature is a key habitat parameter for the structuring of juvenile Atlantic sturgeon summer habitat (Table 8-7). Temperatures in excess of 28ºC are judged to have sublethal effects on Atlantic sturgeon. An increase in temperature coupled with low dissolved oxygen and high salinity can cause loss of juvenile Atlantic sturgeon nursery habitat. Their low tolerance to temperature and low oxygen is of particular concern during the first two summers of life when juveniles are restricted to lower saline waters, and are unable to seek out thermal refuge in deeper waters . . .
>
> Dissolved oxygen is a very important habitat parameter for juvenile Atlantic sturgeon. A large proportion of Atlantic sturgeon nursery habitat has been degraded as a result of persistent low levels of dissolved oxygen. Secor and Niklitschek (2001) report that in habitats with less than 60% oxygen saturation (4.3 mg/L to 4.7 mg/L at 22°C to 27°C), YOY fish aged 30 to 200 days, will

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[31] Attachment 18, Atlantic Sturgeon (Ch. 8), *Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs,* Atlantic States Marine Fisheries Commission (Jan. 2009) at 217-19 (citations omitted).

[32] Attachment 12, 81 Fed. Reg. 35,703.

[33] *Id.*; *see also* Attachment 19, Atlantic sturgeon Habitat Addendum, Atlantic States Marine Fisheries Commission (Sept. 2012) ("Within rivers, the areas of cobble-gravel, coarse sand, and bedrock outcrops, which occur in the rapids complex, may be considered prime habitat (Table 1). This habitat provides Atlantic sturgeon with well-oxygenated water, clean substrates for egg adhesion, crevices that serve as shelter for post-hatch larvae, and macroinvertebrates for food."); Attachment 20, M. Balazik, *Life History Analysis of James River Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) with Implications for Management and Recovery of the Species*, Virginia Commonwealth University (2012); Attachment 21, J.A. Musick, Essential Fish Habitat of Atlantic Sturgeon *Acipenser oxyrichus* in the Southern Chesapeake Bay, Final Report to NOAA/NMFS, VIMS Special Scientific Report #145 (Nov. 5, 2005).

> experience a loss in growth. Mortality of juvenile Atlantic sturgeon has been observed for summer temperatures at levels of less than or equal to 3.3 mg/L (Secor and Niklitschek 2001). Recently, the Chesapeake Bay Program adopted dissolved oxygen guidelines based upon levels that would protect Atlantic and shortnose sturgeon, which show unusually high sensitivity to low oxygen concentrations among estuarine living resources.[34]

As stated in the Atlantic States Marine Fisheries Commission fact sheet for Atlantic sturgeon, "[d]issolved oxygen is very important for Atlantic sturgeon because they show unusually high susceptibility to low oxygen."[35] Temperature is also an important habitat parameter for migration patterns and feeding behaviors. *Id.*

Importantly, increased water temperature decreases the amount of dissolved oxygen. The U.S. Geologic Survey has stated that the "concentration of dissolved oxygen in surface water is controlled by temperature . . . Cold water can hold more dissolved oxygen than warm water."[36] Likewise, the EPA has stated multiple times that thermal discharges will raise the temperature of water and lower its oxygen content, thereby harming aquatic life.[37] For example, while issuing final rules to regulate cooling water intakes, EPA explained the relationship between water temperature and dissolved oxygen as follows:

> Numerous studies have shown that thermal discharges may substantially alter the structure of the aquatic community by modifying photosynthetic, metabolic, and growth rates *and reducing levels of DO* . . . Adverse temperature effects are likely to be more pronounced in aquatic ecosystems that are already subject

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[34] Attachment 18, Atlantic Sturgeon (Ch. 8), *Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs,* Atlantic States Marine Fisheries Commission (Jan. 2009) at 231-32 (citations omitted); *see also* Attachment 22, D. H. Secor and T. E. Gunderson, *Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon*, Acipenser oxyrinchus, Fishery Bulletin 96(3) (1998).

[35] Attachment 23, Atlantic sturgeon Habitat Fact Sheet, Atlantic States Marine Fisheries Commission.

[36] Attachment 24, U.S. Geological Survey, *The USGS Water Science School – Water properties: Dissolved oxygen*.

[37] Attachment 25, Office of Water, U.S. EPA, *Volunteer Stream Monitoring: A Methods Manual*, EPA 841-B-976-003 (Nov. 1997) at §§ 5.2, 5.3 ("Temperature affects the oxygen content of the water (oxygen levels become lower as temperature decreases) . . ."); Attachment 26, National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities, 79 Fed. Reg. 48,300, 48,412 (Aug. 15, 2014) ("Thermal discharges [from cooling systems] also harm aquatic life by reducing levels of dissolved oxygen, altering the location and timing of fish behavior such as spawning, aggregation, and migration, and may cause thermal shock-induced mortality for some species.").

> to other environmental stressors such as high biochemical oxygen demand (BOD) levels, sediment contamination, and pathogens. Reduced waterbody volume due to the effects of climate change and/or lengthy droughts could exacerbate these effects."[38]

Maintaining high levels of dissolved oxygen is critical for the survival of Atlantic sturgeon and rehabilitating the spawning grounds in the James River. In one study examining the effects of hypoxia and temperature on the survival of Atlantic sturgeon, zero specimens survived at a temperature of 26º C and low levels of dissolved oxygen.[39] The study concluded that population declines of the Atlantic sturgeon may have resulted in part due to the increased temperatures in the Chesapeake Bay benthic habitats and hypoxic conditions in summer months (temperatures > 25º C and dissolved oxygen levels <4.0 mg O_2/L).

As reflected by the research consensus, and as set forth in the proposed critical habitat designation, the James River has limited hard substrate locations. High amounts of gravel, cobble, and rock, however, are located in the James River immediately adjacent to the CPS, and continuing downstream through Dutch Gap to where Farrar Gut joins the James River.[40]

This prime spawning habitat has in fact been used for spawning. In October 2015, during the well-documented fall spawning period, two Atlantic sturgeon larvae were entrained at the CPS.[41] The entrainment resulted in the death of the Atlantic sturgeon larvae, an ESA "take" for which Dominion had no permit. The timing (during the fall spawning period) and location of the unpermitted take confirm that the James River immediately adjacent is an active spawning region. Further, the unpermitted take confirms that the CPS is already having a documented negative impact on the endangered Atlantic sturgeon population.

Atlantic sturgeon are benthic feeders that filter quantities of mud, sand, and organic debris along with their food which, while in freshwater, consists of aquatic insects, amphipods, and ologochaete worms.[42] In addition to water temperature, dissolved oxygen and loss of

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[38] Attachment 26, National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities, 79 Fed. Reg. 48,300, 48,320 (Aug. 15, 2014) (Aug. 15, 2014).

[39] Attachment 22, D. H. Secor and T. E. Gunderson, *Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon*, Acipenser oxyrinchus, Fishery Bulletin 96(3) (1998).

[40] Attachment 17, D. M. Bilkovic et al., *Atlantic Sturgeon Spawning Habitat on the James River, Virginia*, Final Report to NOAA / NOAA Chesapeake Bay Office, Virginia Institute of Marine Science, Center for Coastal Resources Management (Feb. 2009) at 19-20.

[41] Attachment 27, Email from C. Linderman to B. Trulear re: 316(b) Annual Reporting to the Services (May 13, 2016), and Attachment 27A (spreadsheet attached to email).

[42] Attachment 21, J.A. Musick, *Essential Fish Habitat of Atlantic Sturgeon Acipenser oxyrichus in the Southern Chesapeake Bay*, Final Report to NOAA/NMFS, VIMS Special Scientific Report #145 (Nov. 5, 2005) at 14; Attachment 28, Jerre Mohler, *Culture Manual for the Atlantic Sturgeon*, U.S. Fish & Wildlife Service (2003).

spawning substrate, Atlantic sturgeon are also susceptible to a variety of contaminants, in particular polychlorinated biphenyls (PCBs), cadmium, mercury, and lead.[43] In fact, one toxicity test for Atlantic sturgeon indicated that sturgeon are "similar to or somewhat more sensitive to contaminant exposure than rainbow trout."[44] As bottom feeders, whose lives can span many decades, sturgeon are also particularly susceptible to bioaccumulation and bioconcentration of contaminants.[45] PCBs are particularly harmful to aquatic species such as sturgeon, as explained in a recent ESA Section 7 biological opinion:

> PCBs tend to be bound to sediments and also bioaccumulate and biomagnify once they enter the food chain. This tendency to bioaccumulate and biomagnify results in the concentration of PCBs in the tissue concentrations in aquatic-dependent organisms. These tissue levels can be many orders of magnitude higher than those observed in sediments and can approach or even exceed levels that pose concern over risks to the environment and to humans who might consume these organisms. PCBs can have serious deleterious effects on aquatic life and are associated with the production of acute lesions, growth retardation, and reproduction impairment . . . Given that Atlantic sturgeon have similar sensitives to toxins as shortnose sturgeon it is reasonable to anticipate that Atlantic sturgeon have been similarly affected.[46]

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[43] Attachment 23, Atlantic sturgeon Habitat Fact Sheet, Atlantic States Marine Fisheries Commission.

[44] Attachment 46, F.J. Dwyer, et al., *Assessing Contaminant Sensitivity of American Shad, Atlantic Sturgeon and Shortnose Sturgeon*, U.S. Geological Survey, Columbia Environmental Research Center (2000); *see also* Attachment 47, F.J. Dwyer, et al., *Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests*, Arch. Envt'l Contam. Toxicol. 48, 174-83 (2005).

[45] Attachment 48, S.J. Te, et al., *Bioaccumulation and chronic toxicity of dietary L-selenomethonine in juvenile white sturgeon, Acipenser transmontanus*, Aquatic Toxicology (Nov. 2006) (finding selenium accumulated in liver, kidney, muscle, gill, and plasma tissues of white sturgeon); Attachment 49, S. Heidary, et al., *Bioaccumulation of heavy metals Cu, Zn, and Hg in muscles and liver of the stellate sturgeon in the Caspian Sea and their correlation with growth parameters*, Iranian J. of Fisheries Sciences (Nov. 2011) (finding that as a benthos feeder, heavy load of metals in their body may significantly influence metals concentration in species); Attachment 50, NOAA National Marine Fisheries Service, Endangered Species Act Section 7 Consultation, Biological Opinion (Apr. 10, 2013) at 54 (explaining that sturgeon have "long life span, extended residence in estuarine habitats," and as "a benthic omnivore, [are] predispose[d] . . . to long term repeated exposure to environmental contaminants and bioaccumulation of toxicants").

[46] Attachment 50, NOAA National Marine Fisheries Service, Endangered Species Act Section 7 Consultation, Biological Opinion (Apr. 10, 2013) at 54-55.

II. SPECIFIC COMMENTS

A. VDEQ Has Ignored Available Technology That Can Significantly Reduce Pollutant Concentrations in Wastewater at Chesterfield Plant.

1. The Clean Water Act Requires Technology-Based Effluent Limitations as the Minimum Level of Control Required for Pollution Discharge Permits

It is well-established that VDEQ must comply with the federal Clean Water Act and its implementing regulations in administering the VPDES permitting program. Virginia operates the VPDES program under delegated authority from the Environmental Protection Agency, and compliance with federal law is an express condition of the delegation.[47] Accordingly, state VPDES regulations prohibit permits that do not comply with the Clean Water Act or its regulations.[48]

The Clean Water Act endeavors "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" in part through the development of "technology necessary to eliminate the discharge of pollutants into the navigable waters of the United States."[49] Thus, federal regulations set technology-based effluent limits as the minimum level of control required for a pollution discharge permit.[50] According to 40 C.F.R. § 125.3:

> [t]echnology-based treatment requirements under section 301(b) of the Act represent the *minimum* level of control that *must be imposed* in a permit issued under section 402 of the Act.[51]

This requirement expressly applies to delegated state programs.[52] VDEQ "stand[s] in the shoes of [the EPA] Administrator" and must impose technology-based limits as the minimum level of control in its VPDES permits.[53]

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[47] *See* 40 C.F.R. § 123.1 et seq.

[48] 9VAC25-31-50.C.1. ("[N]o permit may be issued . . . [w]hen the conditions of the permit do not provide for compliance with the applicable requirements of the CWA or the law, or regulations promulgated under the CWA or the law[.]").

[49] 33 U.S.C. § 1251(a).

[50] *See* 40 C.F.R. § 122.44 ("[E]ach NPDES permit shall include conditions meeting the following requirements when applicable. (a)(1) Technology-based effluent limitations and standards based on: effluent limitations and standards promulgated under section 301 of the CWA, or new source performance standards promulgated under section 306 of CWA, on case-by-case effluent limitations determined under section 402(a)(1) of CWA, or a combination of the three, in accordance with § 125.3 of this chapter."); 40 C.F.R. § 125.3.

[51] 40 C.F.R. § 125.3(a) (emphasis added).

[52] *See* 40 C.F.R. § 123.25(a)(15), (36).

VDEQ can impose technology-based treatment requirements in the following ways: "(1) Application of EPA-promulgated effluent limitations developed under section 304 of the Act to dischargers by category or subcategory . . . . (2) On a case-by-case basis under section 402(a)(1) of the Act, to the extent that EPA-promulgated effluent limitations are inapplicable[,]" or through a combination of the methods and specific factors contained in 40 C.F.R. § 125.3(d).[54] Where promulgated effluent limitations are not applicable, under CWA Section 402(a)(1)(B) [33 U.S.C. 1342(a)(1)(B)], VDEQ "must determine on a case-by-case basis what effluent limitations represent the BAT [best available technology economically achievable] level."[55] DEQ's best professional judgment in determining BAT on a case-by-case basis "take[s] the place of uniform national guidelines" promulgated under § 402(a)(1)(A) [33 U.S.C. 1342(a)(1)(A)].[56]

Federal effluent limitations are inapplicable and therefore require technology-based standards developed on a case-by-case basis in the following situations: (1) pollutants not covered by federal effluent limitations and for (2) aspects of operations or activities not covered by federal effluent limitations.

> Where promulgated effluent limitations guidelines only apply to certain aspects of the discharger's operation, or to certain pollutants, other aspects or activities are subject to regulation on a case-by-case basis in order to carry out the provisions of the Act.[57]

Citing to this regulatory language, EPA's NPDES Permit Writer's Manual confirms that federal effluent limitations are inapplicable when they do not include requirements for the "pollutant of concern" or when the facility does not "perform the industrial operation triggering" the limitations.[58]

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[53] *Natural Resources Defense Council, Inc. v. U.S. EPA*, 859 F.2d 156, 183 (D.C. Cir. 1988) ("States issuing permits pursuant to § 1342(b) stand in the shoes of the agency, and thus must similarly pay heed to § 1311(b)'s technology-based standards when exercising their BPJ. Thus, notwithstanding Industry's contrary assertions, States are required to compel adherence to the Act's technology-based standards regardless of whether EPA has specified their content pursuant to § 1314(b)."); *N. Cheyenne Tribe v. Mont. Dep't of Envt'l Quality,* 356 Mont. 296, 305 (2010) ("DEQ—as a 'permit writer'—must adhere to the same requirement as the Administrator of implementing pre-discharge treatment standards as the minimum level of control required in all permits.").

[54] 40 C.F.R. 125.3(c)(1)-(3).

[55] *Texas Oil & Gas Assn. v. EPA*, 161 F.3d 923, 928-29 (5th Cir. 1998).

[56] *Id.* at 929.

[57] 40 C.F.R. § 125.3(c)(3).

[58] Attachment 29, U.S. EPA, NPDES Permit Writer's Manual at 5-45, 46 (Sept. 2010).

2. *VDEQ Must Set Technology-Based Limits on a Case-by-Case Basis Where Federal Effluent Limitations are Inapplicable to the Wastewater Streams and Contaminants at the CPS.*

EPA's final "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category" (the "Power Plant ELGs") do not obviate VDEQ's obligation to impose technology-based standards for arsenic and other metals in the wastewater at the CPS.[59] These effluent limitations do not apply to arsenic and other toxic metals contained in coal ash wastewater from legacy ponds, nor do they apply to activities, like draining and dewatering, which are outside the normal operation of coal ash impoundments.

The Power Plant ELGs establish best available technology limits for only total suspended solids, oil and grease in "legacy wastewater" discharged from inactive coal ash impoundments like the Upper and Lower Ash Ponds.[60] EPA did not create a technology-based standard for any other pollutants because, the agency concluded, power plants handle legacy wastewater in many different ways throughout the country, including combining it and diluting it with other waste streams and precipitation.[61] Thus, "the characteristics of legacy wastewater contained in surface impoundments (flow rate and *pollutant concentrations*) vary at both any given plant, as well as across plants nationwide," and EPA did not have sufficient data to create nationwide effluent limitations.[62] VDEQ is not similarly constrained by inconsistent data at the CPS. Dominion has or can obtain information on the concentration of pollutants in wastewater in the ash ponds.

The Power Plant ELGs also did not contemplate activities other than the normal operations for coal ash impoundments, *i.e.* the passive discharge of treated wastewater when the impoundment's volume reaches the level of an engineered outfall.[63] Here, however, Dominion seeks, in part, authorization to drain water from the Upper and Lower Ash Ponds, which is the highly polluted water in contact with and saturating coal ash. Draining and dewatering a coal ash impoundment in preparation for closure is an aspect of the pond's operation that is not contemplated by the effluent limitations for legacy coal ash ponds promulgated by EPA.

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[59] *See* Attachment 30, Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 80 Fed. Reg. 67,838. These new effluent limitations will not apply to coal ash ponds at Clinch River Plant until after November 1, 2018.

[60] *See* Attachment 30, Power Plant ELGs at 67,854. The rule defines "legacy wastewater" as "FGD wastewater, fly ash transport water, bottom ash transport water, FGMC wastewater, or gasification wastewater generated prior to the date determined by the permitting authority that is as soon as possible beginning November 1, 2018, but no later than December 31, 2023."

[61] *See id.* at 67,855.

[62] *See id.* (emphasis added).

[63] *See* Attachment 30, Power Plant ELGs at 67,855 ("EPA also decided not to establish BAT limitations for legacy wastewater based on a technology other than surface impoundments . . . .").

In these circumstances, federal regulations require that VDEQ apply technology-based treatment standards developed on a case-by-case basis.[64] Thus, to comply with the Clean Water Act, VDEQ must use its best professional judgment to evaluate technology standards for the wastewater discharges from the CPS, based on the best available technology economically achievable.[65] In these circumstances, best professional judgment in determining the best available technology economically achievable "thus take[s] the place of uniform national guidelines, but the technology-based standard remains the same."[66] We further observe that the Clean Water Act provides that "such effluent limitations shall require the elimination of discharges of all pollutants if the Administrator finds . . . that such elimination is technologically and economically achievable."[67]

Prior to the promulgation of the new Power Plant ELGs, EPA Region 4 insisted on technology-based standards on a case-by-case basis for similar discharges of legacy wastewater from coal ash ponds in North Carolina. In a September 16, 2014 letter from Region 4 to the North Carolina Department of Environment and Natural Resources, EPA insisted that the permitting agency apply "additional technology-based effluent limitations on a case-by-case basis on best professional judgment" for draining and dewatering discharges at the L.V. Sutton Steam Station.[68] Specifically, the agency noted that these limitations should address pollutants "that are not included in effluent guidelines for the steam electric power generating industry in 40 CFR Part 423."[69]

North Carolina has either applied technology-based standards, or equally or more stringent water quality-based standards, for draining and dewatering legacy wastewater from coal ash impoundments, even following the release of the new effluent limitations from EPA. These limits are far more stringent than the limits proposed here for the CPS. In 2014, North Carolina developed technology-based standards for a discharge permit renewal for the Riverbend Steam Station recognizing that "[t]he existing federal regulations require development of Technology Based Effluent Limits for the parameters of concern."[70] North Carolina proposed limits

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[64] 40 C.F.R. § 125.3(c)(3).

[65] *See* 33 U.S.C. §§ 1251(a)(1), 1311(b)(1)(A); 40 C.F.R. §§ 122.44, 125.3.

[66] *Texas Oil & Gas Assn. v. EPA*, 161 F.3d 923, 928-29 (5th Cir. 1998); *see also*, *Natural Resources Defense Council, Inc. v. U.S. EPA*, 859 F.2d 156, 183 (D.C. Cir. 1988) (States "are required to compel adherence to the Act's technology-based standards regardless of whether EPA has specified their content . . . ."); *Northern Cheyenne Tribe v. Montana Dept. of Environmental Quality*, 356 Mont. 296, 303 (Mont. 2010).

[67] 33 U.S.C. § 1311(b)(2)(A) (emphasis added).

[68] Attachment 31, Letter from M. Nuhfer, Chief, Municipal & Industrial NPDES Section, EPA Region 4 to J. Poupart, Chief, Permitting Section, Division of Water Quality, North Carolina Department of Environment & Natural Resources (Sep. 16, 2014).

[69] *Id.*

[70] Attachment 32, N.C. Dep't of Envtl. Quality, Fact Sheet for the NPDES Permit Development for Riverbend Steam Station, NPDES No. NC0004961 (May 21, 2014).

significantly more stringent than those contained in the Draft Permit for the CPS for total arsenic (10.5 µg/L as a monthly average and 14.5 µg/L as a daily maximum) and total mercury (47.0 ng/L as a monthly average and 47.0 ng/L as a daily maximum).[71] The final permit for Riverbend continues to require the same technology-based limits based on the agency's best professional judgment for discharges, including dewatering discharges, from the plant's ash pond.[72]

Limits that are technologically achievable in North Carolina are technologically achievable in Virginia, and VDEQ must impose technology-based standards for the pollutants of concern present in the proposed discharges at the CPS in order to fulfill its obligations under the Clean Water Act. The Power Plant ELGs do not set limits for the particular pollutants in this waste stream nor do they account for this particular operational process. The agency must do so through the utilization of its best professional judgment on a case-by-case basis as required by existing federal law and implementing federal and state regulations.[73] As we explain below, economically achievable technology exists to significantly reduce the levels of pollutants in these discharges.

State water quality standards provide a "supplementary basis" to further regulate numerous point sources "to prevent water quality from falling below acceptable levels."[74] But water quality standards are not an adequate substitution in the face of the failure to implement required technology-based effluent limitations. VDEQ's failure to apply technology-based effluent limits here simply does not comply with the law.

3. An Advanced Wastewater Treatment Plant Can Effectively Treat the Wastewater from the Upper and Lower Ash Ponds.

Under the Clean Water Act, the technology standard that applies to arsenic and the other toxic metals in coal ash wastewater at the CPS is the "best available technology economically achievable."[75] As a permit requirement, Dominion will be submitting a conceptual engineering report that will set forth a plan to treat wastewaters at the facility.[76] Since this concept engineering report has not yet been submitted, however, there is simply no support in the record that VDEQ has applied technology-based limits in the Draft Permit. In its permit application,

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[71] *See id.*

[72] *See* Attachment 33, N.C. Dep't of Envt'l. Quality, Final Permit for Riverbend Steam Station, NPDES Permit No. NC0004961.

[73] *See*, *e.g.*, 33 U.S.C. § 1311(b)(2)(A); 40 C.F.R. § 125.3; 9VAC25-31-220.A; *see also Texas Oil & Gas Ass'n v. U.S. E.P.A.*, 161 F.3d 923 (5th Cir. 1998) (When applying BPJ, "[i]ndividual judgments []take the place of uniform national guidelines, but the technology-based standards remain the same.").

[74] *PUD No. 1 of Jefferson County v. Washington Dept. of Ecology*, 511 U.S. 700, 704 (1994), *quoting EPA v. California ex rel. State Water Resources Control Bd.*, 426 U.S. 200, 205, n. 12 (1976) (internal quotations omitted).

[75] *See* 40 C.F.R. § 125.3(a)(2)(iii)-(iv).

[76] Permit Application at pp. 93-94.

Dominion has not provided any details regarding the Centralized Source Water Treatment System (CSWTS), and it remains possible that alternative outfalls could be used for discharge from Outfall 101. As such, the approval of the Draft Permit should remain pending, until the concept engineering report and CSWTS have been submitted and reviewed. Once those plans have been submitted, VDEQ must then establish proper technology-based limits for the dewatering discharges based on the use of this treatment technology.[77]

The fact that technology-based standards are achievable at the CPS is further supported by the fact that Dominion has successfully applied wastewater treatment systems at Bremo and Possum Point plants to treat similar coal ash dewatering wastewaters. Dominion has already installed advanced wastewater treatment systems at those locations, publishing weekly water testing results for both sites that show that the wastewater treatment systems drastically reduce contaminant concentrations. This includes heavy metals and other pollutants such as arsenic, chromium, lead, mercury, and selenium.[78] According to these published results, the Bremo and Possum Point wastewater treatment systems routinely achieve concentrations below the applicable quantification levels for antimony, arsenic, cadmium, chromium III, chromium VI, copper, lead, mercury, nickel, selenium, silver, thallium, zinc, and chlorides.

Thus, Dominion's wastewater treatment systems at Bremo and Possum Point, as well as the technology in place at Riverbend in North Carolina, make clear that technology-based solutions are very effective in removing metals—and are also economically achievable.

Despite this successful technology, the Draft Permit sets limits many times higher, and often orders of magnitude higher, than what has already been achieved at Bremo and Possum Point. These limits are based on achieving water quality standards outside of a toxic mixing zone (*i.e.*, a chronic and acute 2:1 mixing ratio in the receiving stream).[79] As described above, however, technology-based limits must also be developed here on a case by case basis, with limits set based on the more stringent of either the technology based or water quality based limits. Setting of water quality based limits far in excess of what can be achieved using existing technology—including technology that has been demonstrated at Dominion's own plants—does not comply with the CWA, which requires technology-based limits. This applies to both the dewatering period, as well as to normal operations.

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[77] Attachment 34, Report of Randall Grachek, Evaluation of Permit Requirements for Wastewater Discharge from Coal Ash Pond Closure – Dominion Power Company, Chesterfield Power Station (July 21, 2016) at 10. The Southern Environmental Law Center engaged Mr. Randall Grachek, a professional engineer with expertise in wastewater process design, to evaluate the Draft Permit in terms of its wastewater management, treatment, and effluent limits. His report, included in full as Attachment 34, is incorporated fully into these comments by reference.

[78] Attachment 35, Weekly Water Testing Results, Bremo Power Station; Attachment 36, Weekly Water Testing Results, Possum Point Power Station.

[79] Attachment 34, Report of Randall Grachek at p. 10.

VDEQ should also evaluate whether other waste streams can and should be treated by the forthcoming wastewater treatment system.

B. The Draft VPDES Permit Does Not Comply with the Clean Water Act Because it Authorizes Discharges Far in Excess of Water Quality Standards, Instead Relying on Dilution to Meet Water Quality Standards.

To comply with the CWA, VDEQ must incorporate technology-based limits as set forth above. In addition to failing to apply technology-based limits, the draft permit authorizes "dewatering" discharges at concentrations that exceed the applicable Virginia water quality standards, as set forth in Table 1 below.

Table 1: Overview of "Dewatering" Limits in the CPS Permit Compared to Water Quality Standards[80]

Parameter All numbers expressed as total recoverable in µg/L (micrograms per liter) unless otherwise indicated.	**Monthly Average Limit in CPS Draft Permit**	**Maximum Limit in CPS Draft Permit**	**VA Human Health Standard for Public Water Supplies**	**VA Human Health Standard for Other Waters (fish consumption)**	**VA Aquatic Life - Chronic**	**VA Aquatic Life – Acute**
Antimony	1,300	1,300	5.6	640		
Arsenic	240	440	10		150	340
Cadmium[81]	1.4	2.6	5		0.82	2.45
Chromium III	100	190	100 (total)		53	405
Chromium VI	17	32			11	16
Copper	11	20	1,300		6	9
Lead	17	31	15		8	70
Mercury	1.2	2.2			.77	1.4

[80] Draft Permit, Part A.2.a.

[81] The aquatic life criteria for cadmium, chromium III, copper, lead, nickel, silver, and zinc depend on the water hardness and are calculated herein using the mean hardness for Outfall 101 listed as 66 mg/L in the Reasonable Potential Analysis. Draft Permit Fact Sheet, Attachment 5.f.

Nickel	26	48	610		14	129
Selenium	7.7	14	170		5	20
Silver	2.7	5.0				1.7
Thallium	0.90	0.90	.24	.47		
Zinc	100	190	7,400	26,000	82	83
Chloride (mg/L)	360	660	250		230	860

As shown in Table 1, the draft VPDES Permit sets dewatering limits far in excess of applicable standards for aquatic life and human health. But the wastewater from Outfall 101 will discharge via Outfalls 001 and 002, into the James River, where Atlantic sturgeon spawn.[82] In order to justify the discharge of pollution at concentrations exceeding ambient standards, VDEQ relies on the use of cooling water and the James River to dilute the concentration of the released pollutants. This approach is not sufficiently protective of water quality and will allow the discharge of pollutants above water quality standards, in violation of the Clean Water Act.

In order to justify the discharge of pollution at concentrations exceeding ambient standards, VDEQ relies on a 2:1 mixing ratio and an assumption of complete mixing. These are not proper assumptions. The term “mixing zone” is defined in the Virginia Administrative Code as “a limited area or volume of water where initial dilution of a discharge takes place and where numeric water quality criteria can be exceeded but designated uses in the water body on the whole are maintained and lethality is prevented.”[83] Virginia regulations contain default limits on the use of mixing zones.[84] For example, 9 Va. Admin. Code § 25-260-20.B.1. provides that mixing zones: “evaluated or established by the board in fresh water shall not:

a. Prevent movement of or cause lethality to passing and drifting aquatic organisms through the water body in question;

b. Constitute more than one half of the width of the receiving watercourse nor constitute more than one third of the area of any cross section of the receiving watercourse;

c. Extend downstream at any time a distance more than five times the width of the receiving watercourse at the point of discharge.

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[82] Draft Permit Fact Sheet, Attachment 3 at p.7.

[83] 9 Va. Admin. Code § 25-260-5.

[84] 9 Va. Admin. Code. § 25-260-20.

Virginia regulations further provide that "No mixing zone shall be used for, or considered as, a substitute for minimum treatment technology required by the Clean Water Act and other applicable state and federal laws."[85] This requirement is not subject to waiver. But that is exactly what the draft permit does: it allows Dominion to use the James River to dilute its pollution in lieu of applying the best available technology economically achievable required by the Clean Water Act.[86] As discussed above, the facility will utilize a wastewater treatment system that should be able to achieve stringent effluent limitations, just as Dominion has achieved at Bremo and Possum Point. Strict limits should be applied here based on aggressive use of this technology.

Moreover, state regulations also provide that "[t]he board shall not approve a mixing zone that violates the federal Endangered Species Act of 1973, (16 USCA §§ 1531 – 1543) or the Virginia Endangered Species Act, Article 6 (§ 29.1- 563 et seq.) of Chapter 5 of Title 29.1 of the Code of Virginia." As set forth in the VPDES Permit Guidance:

> Due to the fact that protection is not provided for species that are resident within a mixing zone, this guidance should not be applied to a stream or stream segment that contains important resident species that are deemed to require special protection from toxic effects. This is a decision that the permit writer will have to make based on a site inspection, their detailed knowledge of specific situations, public comments and/or comments from other agencies. This exclusion acknowledges that there are some waters having critical beneficial uses or sensitive resident species where a RMZ, with the appropriate spatial restrictions, should be specified as a matter of course.
>
> If the receiving water has a rare and endangered species within reasonable proximity of the proposed mixing zone then this guidance should not be used unless data exists that demonstrate that the parameters for which a mixing zone is being allowed will not result in adverse impacts on that species.[87]

As described above, however, the substrate directly below and in the immediate vicinity of Outfalls 001 and 002 has been assessed as optimal spawning habitat for Atlantic sturgeon consisting of cobble, gravel, and bedrock. In fact, Atlantic sturgeon larvae, just several days old, have already been entrained at the CPS in October 2015, and another adult Atlantic sturgeon was impinged in 2005. Thus, Atlantic sturgeon are known to be present in the precise area where wastewater from Outfall 101 (via Outfalls 001 and 002) will discharge into the James River. In other words, Atlantic sturgeon are likely to come into contact with wastewater that will contain

[85] 9 Va. Admin. Code § 25-260-20.B.7.

[86] *See* 33 U.S.C. § 1311(b)(2)(A); 40 C.F.R. § 125.3(g).

[87] Attachment 37, Guidance Memo No. 00-2011, Guidance on Preparing VPDES Permit Limits at p. 19.

high levels of contaminants—far in excess of water quality criterion—before dilution and mixing have occurred. Moreover, as described above, as benthic feeders with long life spans, sturgeon are particularly susceptible to bioaccumulation of contaminants, such as PCBs and heavy metals.[88] Thus, the proposed discharges violate both state law and are contrary to the express instructions from VDEQ's own guidance document.

Moreover, VDEQ's own permitting guidance makes clear that the use of mixing zones is generally invalid for tidal waters.[89] Large effluents that are discharged through subsurface diffusers result "in a rising plume(s) that may or not reach the surface . . . **This means that the complete mix assumption is practically never appropriate for tidal waters**."[90] Thus the use of a mixing zone is contrary to VDEQ guidance, since the James River and Farrar Gut are tidal freshwater, and the CPS relies on subsurface diffusers for large effluent volumes.[91]

Finally, DEQ should take note of the possibility of cumulative and/or synergistic impacts as a function of the combination of metals, salts, and high temperature discharges. At elevated temperatures, the metals contained in the discharges of coal ash water may be even more toxic than at normal stream temperatures.[92] This is particularly true for the endangered Atlantic sturgeon, which, as described above, is likely spawning in the immediate vicinity and is particularly sensitive to temperature, dissolved oxygen, and contaminants such as mercury and lead. Moreover, one recent study estimated the cumulative impact of thermoelectric production on riverine ecosystems in the Northeast, including the James River basin, for the 2000 to 2010

[88] *See, e.g.*, Attachment 50, NOAA's National Marine Fisheries Service, Endangered Species Act Section 7 Consultation, Biological Opinion (Apr. 10, 2013).

[89] *Id.* at pp. 28-30.

[90] *Id.* at p. 29 (emphasis in original).

[91] Attachment 34, Report of Randall Grachek at p. 11.

[92] *See Mixing Zones: Unreasonable Interference—Discussion Paper #* 1, State of Idaho, Department of Environmental Quality, June 2014, *available at https://www.deq.idaho.gov/media/1117518/58-0102-1401-discussion-paper1-0614*.pdf; Prasada Rao, D. G. V. and M. A. Q. Khan 2000. *Zebra Mussels: Enhancement of copper toxicity by high temperature and its relationship with respiration and metabolism*. Water Environment Research, Vol. 72, No. pp. 175-178; Kamel Naouel, Thierry Burgeot, Mohamed Banni, Mohamed Chalghaf, Simon Devin, Christophe Minier & Hamadi Boussetta. 2014. *Effects of increasing temperatures on biomarker responses and accumulation of hazardous substances in rope mussel*s (*Mytilus galloprovincialis*) from Bizerte lagoon. Environ Sci. Pollut. Res. 21:6108–6123 ; BAT, Levent; Mehmet AKBULUT; Mehmet ULHA; Ayße G.NDOÚDU; Hasan H.seyin SATILMIÞ. 2000. *Effect of temperature on the toxicity of zinc, copper and lead to the freshwater amphipod Gammarus pulex pulex* (L., 1758). Turk J Zool 24: 409-415; Khan, M. A. Q.; S. A. Ahmed; Bogdon Catalin; A. Khodadoust; Oluwaleke Ajayi & Mark Vaughn. 2006*. Effect of temperature on heavy metal toxicity to juvenile crayfish, Orconectes immunis* (Hagen). Environ. Toxicol. 21: 513–520.

period.[93] That study found that thermoelectric plants in the James River basin raised the river's water temperature on by 3.9º C annually, and in summer, by 8.2º C.[94] These temperature increases were the highest amongst all eight basins included in the study by wide margin, and despite the fact that the amount of thermoelectricity produced along the James River basin was in the bottom half of all basins.[95] In other words, thermoelectric plants along the James River discharge significantly more heat to the James River basin without providing a comparable amount of electricity to the community.

C. The Draft Permit Fails to Require ELG Compliance "As Soon As Possible."

EPA implemented the Power Plant ELGs in part, because it recognized that the contaminants like arsenic that are being discharged in these waste streams represent a significant cancer risk for humans:

> EPA estimates that reductions in arsenic loadings from the final rule will result in a reduction in potential cancer risks to humans that consume fish exposed to steam electric power plant discharges. In addition, based on the downstream RSEI modeling, EPA estimates that numerous river miles downstream RSEI modeling, EPA estimates that numerous river miles downstream from steam electric discharges contain fish contaminated with inorganic arsenic that present cancer risks to at least one of the evaluated cohorts. The final rule substantially reduces this number of miles.[96]

Against this backdrop, the EPA's final rule required utilities to come into compliance "as soon as possible beginning November 1, 2018," but "no later than December 31, 2023."[97]

Despite this important directive, the Draft Permit requires only that Dominion come into compliance with the final limits derived from the Power Plant ELGs within four or six years.[98] Nowhere does the Draft Permit or supporting record establish that this time frame is "as soon as possible" as required by the Power Plant ELGs. In fact, according to Mr. Randall Grachek, a wastewater engineer retained by SELC and JRA with considerable experience in wastewater treatment, Dominion can install a system to achieve compliance with the Power Plant ELGs by

[93] Attachment 52, R. Stewart, et al., *Horizontal cooling towers: riverine ecosystem services and the fate of thermoelectric heat in the contemporary Northeast US*, IOP Publishing, Envt'l Res. Letter 8 (2013).

[94] *Id.* at 4 (Table 1).

[95] *Id.*

[96] Attachment 30, 80 Fed. Reg. at 67,874 (Nov. 8, 2015).

[97] Attachment 30, 80 Fed. Reg. at 67,854 (Nov. 8, 2015).

[98] Draft Permit, Part I.B (pp. 20-21).

late 2017 or early 2018 at the latest[99]—far in advance of the March 29, 2022 date provided in the Draft Permit.[100] Given the importance of the Power Plant ELGs, the significant risk to humans and aquatic life, and the express directive from the EPA to implement these measures "as soon as possible," VDEQ must require a shorter time frame for implementation—no later than the July 2018.

Additionally, prior to the time that the final ELGs become effective, DEQ should evaluate options for interim treatment and setting of interim concentration based limits, as a means of achieving compliance "as soon as possible." For example, DEQ should consider use of the treatment system that will apply to dewatering wastewaters to treat FGD purgewater wastewaters discharged from outfall 402, until such time as the FGD WWTP is installed and put into service.

D. The Permit Contains Insufficient Monitoring Requirements

The current draft permit contains insufficient monitoring requirements. As currently proposed, the effluent standards for Outfalls 004 and 005 do not include most coal ash metals. While the use of these outfalls will cease after their closure, in the meantime, these effluent standards are not protective of human health or the environment. Daily monitoring of flow and chemical constituents at appropriate quantification levels must be established in the permit for all parameters at all times for discharges from Outfalls 004 and 005 (not just during dewatering).[101] Monitoring results should be submitted to VDEQ within 1 day of sampling in order to identify problems in a timely manner.

In addition, Outfalls 001 and 002 should also be monitored for coal ash metals. According to the Draft Permit, the dewatering wastewater from the Upper and Lower Ash Ponds will be treated in the CSWTS (defined as Outfall 101), which is then discharged through Outfalls 001 or 002.[102] But Outfalls 001 and 002 have no flow limits and are subject to no coal ash metals requirements before discharge to the James River. To ensure that coal ash contamination does not reach the James River in any significant amount, coal-ash related effluent limitations should be incorporated for Outfalls 001 and 002—especially given the fact that Dominion has not yet proposed the CSWTS and its design remain unknown.[103]

The permit requires insufficiently frequent monitoring of parameters in discharge from the Low Volume Wastewater Treatment System through outfalls 301, 302, 303, and 304. For interim limits where no limit is set and only monitoring is required (including but not limited to Total Recoverable Copper; Chloride; Total Recoverable Nickel; Total Recoverable Zinc),

[99] Attachment 34, Report of Randall Grachek at p. 11.

[100] Draft Permit, Part I.B.2.

[101] Attachment 34, Report of Randall Grachek at p. 11.

[102] Draft Permit Fact Sheet, Attachment 3 (narrative description of Lower and Upper Ash Pond Decanting/Dewatering Process).

[103] Attachment 34, Report of Randall Grachek at p. 9-10.

monthly monitoring frequency is simply insufficient to provide useful information about the effectiveness of the LVWWTS or effluent characteristics. Monitoring should be required twice weekly. For final limits, where both monthly average and daily maximum limits are set, monthly monitoring is wholly inadequate. A daily maximum limit cannot be effectively enforced with monitoring conducted on a monthly basis. Monitoring frequency should be daily in order to effectively enforce these limits.

As discussed in the Steam Electric ELGs, increases in bromides have been observed at public drinking water intakes where FGD systems have been installed at upstream power plants. Bromide presence in public drinking water source waters may lead to the formation of carcinogenic disinfection by-products ("DBPs"), known as brominated DBPs—including trihalomethanes. At one utility, this led to violation of the trihalomethane Maximum Contaminant Level ("MCL"). DEQ should require monitoring for bromides at all industrial-influenced outfalls at CPS. DEQ should also confer on a regular basis with any downstream public drinking water utilities which may be affected, in particular American Water, and should regularly evaluate the need for limits on bromides at CPS based on the results of monitoring.

The permit requires insufficiently frequent monitoring of parameters in discharge from the Upper Ash Pond and Lower Ash Pond, both Pre-Drawdown through outfall 004 and during dewatering activities through outfall 101. Parameters with numeric monthly and/or daily maximum limits should be monitored daily. Parameters with "no limit" but with monitoring and reporting requirements should be monitored at least twice weekly.

The permit requires insufficiently frequent monitoring of parameters in discharge from the FGD WWTP at outfall 402. Parameters with numeric monthly and/or daily maximum limits should be monitored daily. Parameters with "no limit" but with monitoring and reporting requirements, including those parameters with interim limits setting "no limit," should be monitored at least twice weekly.

For pre-drawdown discharge from the Upper Ash Pond through outfall 005, the permit sets limits only for Flow, pH, Total Suspended Solids, Dissolved Oxygen, and Oil and Grease. The permit should set numeric limits for at least those additional parameters for which limits are set for pre-drawdown discharge from the Lower Ash Pond through outfall 004. In addition, the permit requires insufficiently frequent monitoring of parameters in this discharge. Parameters with numeric monthly and/or daily maximum limits should be monitored daily. Parameters with "no limit" but with monitoring and reporting requirements, including those parameters with interim limits setting "no limit," should be monitored at least twice weekly.

Additionally, the Whole Effluent Toxicity testing requirements in the permit are inadequate to protect the aquatic life present in the James River, including the environmentally sensitive eggs and larvae of the endangered Atlantic Sturgeon, which spawns nearby. WET testing should occur at least once per week during dewatering with results submitted to DEQ within 1 day of testing. In addition, more sensitive species reflecting the sensitivity of the local fauna should be used for the WET testing in lieu of *Ceriodaphnia dubia* (water fleas) and *Pimephales promelas* (fathead minnow).

In addition, the final permit needs to mandate baseline sampling of the James River and Farrar Gut for water quality, sediment quality, ecological health, and fish tissues. The permit must then mandate ongoing sampling of conditions in the James River and Farrar Gut to ensure that the dewatering is not causing harm to aquatic resources or increasing risks to public health. Monitoring of actual conditions in the James River and Farrar Gut during dewatering activities is the only way to ensure that the river is not being harmed, including through processes such as increased bioaccumulation of metals like arsenic and selenium in fish tissues downstream, and through synergistic impacts associated with the combined impact of the high volume of metals and salts, together with the thermal discharges from the plant.

The final permit must also implement a much more rigorous PCB sampling process. The current draft VPDES Permit requires sampling only at a single internal outfall, Outfall 301. Outfall 301, however, is not representative of the entire facility and its various discharges, and will not ensure that PCB discharges are not occurring, as required by the Draft Permit.[104]

Moreover, Method 1668 was designed to "replace[] the current method that is unable to detect low-level PCBs against the Virginia water quality criterion for total PCBs."[105] That old method, which VDEQ has expressly acknowledged cannot detect low-level PCBs, was the only method that Dominion used in testing for PCBs at the CPS.[106] Thus, there is no support in the record for the conclusion that "the data currently indicated that PCBs are not present in the discharge," and that "this permit should neither cause nor contribute to the impairment,"[107] because that data is unable to test properly for PCBs.

Since VDEQ has already acknowledged that the method Dominion used to its outfalls is "unable to detect low-level PCBs," VDEQ should require Dominion to test all non-cooling water outfalls (i.e., Outfalls 101, 301, 302, 303, 304, 004, 401, 401, and 005) for PCBs using method 1668, as well as all stormwater related discharge points. Such testing is particularly critical here, given the fact that the James River is "impaired due to a VDH Fish Consumption Advisory for PCBs," and that Atlantic sturgeon are particularly susceptible to PCB contamination. The results of this testing is necessary under the terms of the Draft Permit, to properly assess the potential for low-level PCB discharge. In addition, the Draft Permit should require more frequent monitoring in accordance with VDEQ's own guidance, including for example, two wet samples at least annually for all stormwater only discharges.[108]

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[104] Draft Permit, Part I.C.9.

[105] Attachment 38, VDEQ, TMDL Guidance Memo No. 09-2001 (Mar. 6, 2009); *see also* Attachment 39, VDEQ, TMDL Guidance Memo No. 09-2001, Amendment No. 1 (Nov. 1, 2011).

[106] Draft Permit Fact Sheet, page 7.

[107] *Id.*

[108] Attachment 38, VDEQ, TMDL Guidance Memo No. 09-2001 (Mar. 6, 2009).

E. Coal Ash Waste is Entering Farrar Gut.

Dominion's Lower Ash Pond is discharging coal ash waste into Farrar Gut. Photographs taken by Jamie Brunkow (Lower James Riverkeeper, James River Association) show unpermitted discharges of coal ash from the Lower Ash Pond into Farrar Gut.[109] These unpermitted discharges are unaddressed by the draft VPDES Permit.

These photographs confirm that cenospheres and other floating or visible waste is discharging into state waters, including through Outfall 004. The floating buoys blocking the outfall are not adequate for collecting or preventing the waste from entering Farrar Gut. Moreover, these buoys block public access and allow Dominion to use state waters for collection of its waste.

F. The Proposed Drawdown Rate of 2 Feet per Day is Out of Line with Drawdown Rates for Other Coal Ash Ponds, and Could Result in Instability.

At all other coal ash sites, DEQ and DCR have imposed a six inch per day drawdown rate to reduce the risk of dam instability and the possibility of failure during dewatering. DEQ should not tolerate any increased risk of a catastrophic failure during drawdown. As such, DEQ should limit drawdown of the Upper and Lower Ash Ponds to 6 inches per day.

G. The Proposed Thermal Variance Violates the Clean Water Act.

Under the CWA, heated industrial wastewater, also called "thermal effluent," is a pollutant that cannot be discharged to a river without an NPDES permit.[110] The U.S. EPA has acknowledged that "thermal pollution has long been recognized to cause harm to the structure and function of aquatic ecosystems."[111] As such, every NPDES permit must impose "any more stringent limitation" necessary to meet "water quality standards," including state standards for temperature.[112]

In other words, permits ordinarily must impose effluent limits on heated wastewater sufficient to satisfy state water quality standards for temperature. Section 316(a) provides only narrow authority for a state to allow a variance from water quality standards for temperature, however, when such effluent limits are "more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife."[113] A "balanced, indigenous population" is defined by EPA to mean, essentially a healthy and

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[109] Attachment 40, Photographs taken by Jamie Brunkow, James River Association (Oct. 24, 2014 – Apr. 5, 2016).

[110] 33 U.S.C. § 1342; *see also* 40 C.F.R. § 122.2 (defining pollutant as including "heat").

[111] U.S. EPA, National Pollution Discharge Elimination System—Suspension of Regulations Establishing requirements for Cooling Water Intake Structures at Phase II Existing Facilities, 72 Fed. Reg. 37,107 (codified at 40 C.F.R. §§ 122, 125 (July 9, 2007).

[112] 33 U.S.C. § 1311(b)(1)(C).

[113] 33 U.S.C. § 1326(a).

sustainable native ecosystem: "a biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species."[114]

Moreover, the impacts of past discharges on the aquatic community cannot be ignored in a § 316(a) demonstration. In particular, shifts in species composition and other adverse impacts attributable to past discharges cannot be disregarded. The balanced, indigenous population of fish, shellfish, and wildlife contemplated by the CWA is the population that exists absent the impacts of the applicant's thermal discharge.[115]

As explained by the EPA Environmental Appeals Board ("EAB"):

> [Section] 316(a) speaks only of "a balanced, indigenous population." . . . [A]ccording to [applicant], the indefinite article "a" cannot be "tortured" into the definite phrase "the balance which would exist in the absence of heat." However, these arguments . . . would render the general goal of the Act -- to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" -- a dead letter. Section 316(a) must . . . be read in a manner which is consistent with the Act's general purposes. Consequently, § 316(a) cannot be read to mean that a balanced indigenous population is maintained where the species composition, for example, shifts . . . from thermally sensitive to thermally tolerant species. Such shifts are at war with the notion of "restoring" and "maintaining" the biological integrity of the Nation's waters.[116]

The EAB affirmed this position again in 2006, explaining that a § 316(a) demonstration may not "ignore the fact that the abundance of a certain species . . . has been altered over the past several decades," because such an interpretation would be "inconsistent with the regulations, the legislative history of section 316(a), the purpose of the CWA, and prior case law."[117]

The thermal variance included in the draft VPDES Permit does not satisfy the requirements of the CWA, and is not supported by the record.

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[114] 33 U.S.C. § 1326(a); *see also* 40 C.F.R. §§ 125.58(f), 125.71(c).

[115] *See* 40 C.F.R. § 125.71(c) (balanced indigenous community excludes "species whose presence or abundance is attributable to the introduction of pollutants that will be eliminated by compliance" with water quality standards); 40 C.F.R. § 125.73(a) (demonstration must consider the "cumulative impact of its thermal discharge together with all other significant impacts on the species affected"; *In re Dominion Energy Brayton Point*, 12 E.A.D. 490, 557 (2006) ("[T]he population under consideration is not necessarily just the population currently inhabiting the water body but a population that may have been present but for the appreciable harm.").

[116] *Pub. Serv. Co. of Ind.*, 1 E.A.D. 590, 28 (1979).

[117] *In re Dominion Energy Brayton Point*, 12 E.A.D. at 558.

First, VDEQ cannot rely on a study from 2003, which in turn relied on data from 1998, to reissue the CPS thermal variance. At the time of the 2003 study, it was not known that the James River contained one of the few spawning populations of Chesapeake Bay DPS Atlantic sturgeon, an endangered species. As described above, temperature is a key factor for Atlantic sturgeon migration, spawning, and juvenile survival. High water temperatures also significantly reduce dissolved oxygen levels, which is also a key environmental factor for Atlantic Sturgeon spawn and juvenile survival rates. A new study is required for this reason alone.

Second, the 2003 study was based on parameters and assumptions that no longer apply. The statement in the draft VPDES Permit that "station operations have not materially changed since the approval of the 316(a) variance in 2004," and that "there is no evidence that the stream characteristics have materially changed in that time,"[118] is contradicted by the record.

Most apparently, in the 2003 study, the effluent temperature data from 1998 for Outfall 003 never exceed approximately 45º C.[119] In the Reasonable Potential Analysis for Outfall 003, however, attached to the draft VPDES Permit, the 90% percentile temperature for that same effluent stream is 51.7º C. In other words, the more recent data shows that this same effluent stream appears to be at least 7º C *hotter* than it was in 1998.[120] In addition, it appears more water is being discharged from Outfall 003 in recent years as compared to 1998. The Reasonable Potential Analysis for Outfall 003 lists the discharge flow as 742 million gallons per day, which equates to 32.5 m^3 per second.[121] The 1998 data shows that the flow through Outfall 003 never even exceeded 30 m^3 per second.[122] In sum, it appears the heated wastewater out of Outfall 003 is being discharged at a rate approximately 10% higher than it was in 1998, and at a temperature at least 7º C hotter.

Similarly, the 2003 study showed effluent temperatures through Outfalls 001 and 002 as never exceeding approximately 40º C.[123] But in the Reasonable Potential Analysis for Outfalls 001 and 002, however, attached to the draft VPDES Permit, the 90% percentile for that same effluent stream is 45º C, or roughly 5º C *hotter* that they were in 1998.[124] The Reasonable Potential Analysis for Outfalls 001 and 002 also erroneously reports the "discharge flow" as 1

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[118] Draft Permit Fact Sheet, Attachment 7.

[119] See Attachment 41, Hydroqual Study, Discharge Temperatures Through Units 4, 5, and 6 (2003).

[120] Draft Permit Fact Sheet, Attachment 5.b, "Reasonable Potential Analysis for Outfall 003."

[121] Draft Permit Fact Sheet, Attachment 5.b, "Reasonable Potential Analysis for Outfall 003."

[122] *See* Attachment 41, Hydroqual Study, Flow through condensers for Units 4, 5, and 6 (2003)

[123] *See* Attachment 41, Hydroqual Study, Discharge Temperatures Through Units 3, 7 and 8 (2003).

[124] Draft Permit Fact Sheet, Attachment 5.a, Reasonable Potential Analysis for Outfalls 001 and 002.

million gallon per day.[125] In fact, Outfalls 001 and 002 discharge much higher amounts, having a 30 day max reported as 212 and 89 million gallons per day, respectively.[126]

Third, the old 2003 study relied heavily on the temperature of the water in Farrar Gut measured at FG4, which is located where Farrar Gut joins the main channel of the James River. The distance from Outfall 003, which discharges into the head of Farrar Gut, to FG4, is *nearly four miles*. The old study relied on a *four mile* mixing zone—which was included in the permit that was in place at the time of the study[127]—when it concluded that the average temperature rise at FG4 due to the discharge of heated cooling water from Outfall 003 was 1.6º C. As the 2003 study explained:

> Station FG4 is a key location at which the thermal loading from Outfall 003 is ultimately discharged to the James River. These temperatures are not high enough to produce significant changes to the hydrodynamic characteristics of the James River system.

This study completely ignores, for example, the effect the heated cooling water has on FG1, which measures the temperature near Outfall 003. But the water at FG1 is a navigable water subject to the CWA just like the water at FG4. The 2003 study and the draft VPDES Permit fail to establish that the thermal variance adequately protects aquatic organisms along the entirety of Farrar Gut, not merely at the point four miles away, where it joins the James River.

Relying on such a large mixing zone would violate express Virginia regulations. For example, 9 Va. Admin. Code § 25-260-20.B.1 provides that mixing zones: "evaluated or established by the board in fresh water shall not":

a. Prevent movement of or cause lethality to passing and drifting aquatic organisms through the water body in question;

b. Constitute more than one half of the width of the receiving watercourse nor constitute more than one third of the area of any cross section of the receiving watercourse;

c. Extend downstream at any time a distance more than five times the width of the receiving watercourse at the point of discharge.

The use of Farrar Gut in this way violates all three subsections of Virginia's mixing zone regulations. Discharging large volumes of water at temperatures as high as 130º F is harmful to aquatic organisms in the mixing zone, in violation of subsection a.[128] Dominion also discharges

[125] Draft Permit Fact Sheet, Attachment 5.a, Reasonable Potential Analysis for Outfalls 001 and 002.

[126] Draft Permit Fact Sheet, Attachment 4.a, DMR Data, August 2012-July 2015.

[127] Draft Permit Fact Sheet, Attachment 7.

[128] As an example, in one study, all Atlantic sturgeon test specimens died at a temperature of 26º C (79º F) in low oxygen conditions. Attachment 22, D. H. Secor and T. E. Gunderson, *Effects of*

so much cooling water that it violates subsection b. And given that Farrar Gut is approximately 500 feet across at the point of discharge, VDEQ cannot rely on a 4 mile mixing zone, as it violates the restriction in subsection c. In addition, Virginia regulations provide that "[n]o mixing zone shall be used for, or considered as, a substitute for minimum treatment technology required by the Clean Water Act and other applicable state and federal law."[129]

Virginia regulations also provide that "[t]he board shall not approve a mixing zone that violates the federal Endangered Species Act of 1973, (16 USCA §§ 1531 – 1543) or the Virginia Endangered Species Act, Article 6 (§ 29.1- 563 et seq.) of Chapter 5 of Title 29.1 of the Code of Virginia." Given the recently discovered presence of an endangered species in the waters that Dominion discharges to, the 2003 study must be reevaluated.

Since the 2003 study reached its conclusions by relying on a four mile mixing zone that cannot apply here, a new study is required to evaluate the thermal effects without relying on a mixing zone that violates state law.

Fourth, the draft VPDES Permit assumes that the receiving stream for Outfall 003 and 004, *i.e.*, Farrar Gut, has the same temperature as the effluent, because Outfall 003 "discharges a large volume of water at the head of Farrar Gut, it creates free flowing stream characteristics in a tidal water body." VDEQ further explains that "because the Outfall 003 discharge creates the free flowing stream condition, it is evaluated as if discharging to a dry ditch with zero flow."[130] This assumption leads to the absurd result that the temperature of the effluent, 51.7º C (90^{th}-percentile), is equal to the temperature of Farrar Gut, the receiving stream.

This is not a reasonable assumption and violates the law. Farrar Gut is a navigable water and not a dry ditch. If Outfall 003 were to stop discharging the large amounts of heated wastewater it currently discharges, tidal freshwater from the James River would undoubtedly continue to flow into and out of Farrar Gut as it currently does, including around Outfall 003. Moreover, the water in Farrar Gut would undoubtedly be much cooler than 51.7º C—which is not a naturally achievable temperature in that environment. By comparison, the background temperature used for Outfalls 001 and 002 in the James River is 29.3º C,[131] *more than 22º C cooler* than the "assumed" temperature at Outfall 003.

Relying on this "assumption" would also completely circumvent Congress' decision to regulate heat as a pollutant under the CWA. The draft VPDES Permit contains no limits for effluent temperatures, and only provides an aggregate "heat rejection" limit. Thus, under this "assumption," Dominion could discharge as much heated cooling water as it wants, in as high a volume as it wants, because it would never be adding heat to the receiving stream. The CWA,

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hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon, Acipenser oxyrinchus, Fishery Bulletin 96(3) (1998).

[129] 9 VAC § 25-260-20.B.7.

[130] Draft Permit Fact Sheet, Attachment 5.b.

[131] Draft Permit Fact Sheet, Attachment 5.a

however, does not provide a pass to polluters who pollute so much so, that the receiving stream takes on characteristics of the effluent.

In sum, there is insufficient evidence in the record to support the reissuance of the variance. Conditions have substantially changed since that study; the 2003 study relied on improper assumptions, in effect, allowing for a four mile mixing zone; and Reasonable Potential Analysis in the current draft VPDES Permit relies on improper assumptions relating to the temperature of the receiving stream.

A new study must be performed to ensure that the CPS heat discharge is not negatively affecting the balanced, indigenous population of shellfish, fish, and wildlife, particularly in light of the known presence of spawning Atlantic sturgeon. Moreover, this new study must evaluate technology-based effluent limitations, including the installation of a closed-cycle cooling system. Such a consideration is required given the presence of spawning Atlantic sturgeon in the immediate area, which is highly sensitive to temperatures above 26º C and low dissolved oxygen levels (a condition that is amplified by high water temperatures). Moreover, discharging heated wastewater (at temperatures exceeding 51.7º C) into a public waterway that is frequented by numerous visitors to the Dutch Gap Conservation Area is a public health hazard. Farrar Gut is a navigable water used by boaters and fishers alike.

In addition, VDEQ must establish temperature limits rather than aggregate heat rejection limits—which are difficult to assess and difficult to enforce. In fact, nowhere in the draft VPDES Permit does the record establish that Dominion is in fact complying with the current heat rejection limits. Moreover, as with contaminants, the CWA requires the use of the best-technology available for thermal discharges.[132] Nowhere does the record establish, however, that any best-technology available analysis has been performed by VDEQ at the CPS. These assessments must be performed—both a new study assessing the thermal impacts, and an analysis of the best cooling system technology available—as they are particularly critical at the CPS, since endangered Atlantic sturgeon spawn in the waters directly adjacent to the CPS, and humans visit the exact waters where hot wastewater is being discharged. Even small amounts of water at current temperatures being discharged from Outfalls 001, 002, and 003 could be lethal to Atlantic sturgeon larvae, juveniles, and even spawning adults, and could injure humans visiting the Dutch Gap Conservation Area. In addition, according to one study, thermoelectric plants in the James River basin raise the temperature of the James River by 3.9º C annually and 8.2º C in the summer.[133] In order to comply with the CWA and the ESA, at a minimum, VDEQ must (a) impose best-technology available wastewater temperature limits; (b) require a new study in support of the thermal variance; and (c) and impose actual temperature limits, rather than BTU per hour limits that were established more than a decade go based on the plant's power generating capacity, rather than the harm to the environment.

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[132] 33 U.S.C. § 1326(b) requiring that "the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact").

[133] R. Stewart, et al., *Horizontal cooling towers: riverine ecosystem services and the fate of thermoelectric heat in the contemporary Northeast US*, IOP Publishing, Envt'l Res. Letter 8 (2013).

H. Additional Clean Water Act Section 316(b) Requirements are Appropriate Here.

The CPS operates five cooling water intake structures ("CWIS") in the James River that have a combined design intake flow of 1,058 million, or 1.058 billion, gallons per day.[134] More than 98 percent of the water withdrawn is used as cooling water.[135] Notably, the pumps that operate the CWIS at CPS "do not have variable speed capabilities, meaning that they are either in operation or are out of operation."[136] At times, due to maintenance needs or energy demand, one or more pumps may be out of operation; typically, in the summer months and winter peaking season, "all pumps are typically in operation."[137] This means that the plant is often operating at the designed intake flow capacity of 1.058 billion gallons per day.

The Draft Permit requires Dominion to implement "interim Best Technology Available (BTA) measures to minimize impingement and entrainment (I&E) mortality and adverse impacts."[138] Impingement and entrainment both can result in injury or mortality to aquatic life. Impingement occurs when an organism larger than the openings in the CWIS screen becomes impacted, or impinged, on that screen (the screens consist of a 3/8 inch or about 0.95 centimeter mesh); entrainment occurs when organisms that are smaller than the screen mesh, especially eggs and larvae, are taken up with the cooling water at the intake.

Dominion's consultant's Draft Impingement Characterization Study Plan (April 10, 2015) and Draft Entrainment Characterization Study Plan (April 10, 2015) were both authored before the October 2015 entrainment of two larval Atlantic Sturgeon at CPS, and so their assessment of the potential for entrainment of early life stages as "unlikely and unexpected" must be reassessed. Both Draft Study Plans must be updated to account for the confirmed take of Atlantic Sturgeon at CPS. Significant priority should be placed on developing and implementing entrainment controls in advance of the next permit reissuance.[139] Such controls should be assessed as studies are completed and information becomes available, instead of waiting for the next permit cycle, five years from now. Of note, entrainment controls typically address impingement also, while the impingement controls in place at the CWIS may not address entrainment.

Studies of swimming capacity of larval Green sturgeon and White sturgeon cited in Dominion's outside consultant's April 10, 2015 Draft Impingement Characterization Study Plan

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[134] Draft Permit Fact Sheet, Attachment 7.

[135] *Id*.

[136] *Id*.

[137] *Id*.

[138] Draft Permit, Part I.D.1.

[139] Given that an unpermitted take has already occurred at the CPS, priority should be placed on Dominion's incidental take permitting process, as the outcome of that permitting process could impact the 316(b) process. VDEQ should require assurance from Dominion that whatever ESA take permitting process Dominion is pursuing is moving forward expeditiously.

showed that tests at flows of 0.67 and 1.2 feet per second ("fps") resulted in 0.68 impingements per fish for Green Sturgeon and 0.02 impingements per fish for White Sturgeon.[140] Approach velocities at the CPS intakes range from 0.6 to 1.0 fps, with through-screen velocities of 1.2 or 1.7 fps, depending on the CWIS unit. Dominion's consultant's discussion of sturgeon swimming capacity cites no studies of Atlantic sturgeon swimming capacity, and notes differences in swimming capacity between Green Sturgeon and White Sturgeon.[141] The document also refers to the ability of juvenile and adult Shortnose Sturgeon, with body lengths greater than 58.1 centimeters, to avoid impingement at intakes with velocities as high as 3.0 fps.[142] However, many of the larvae present in the vicinity of the CWIS at CPS are unlikely to be of this size, as they will have recently hatched from spawning areas in the CPS vicinity, or are migrating downstream from other spawning areas upstream. Atlantic Sturgeon larvae are "active swimmers," leaving the bottom at 8 to 10 days of age "to swim in the water column."[143] Larvae begin moving downstream to rearing grounds at about 8 to 12 days of age, upon completion of the yolk-sac larval stage.[144] Larvae enter the juvenile phase at about 30 millimeters in length, meaning that the larvae swimming past the CPS and being impinged or entrained by the CWIS are not nearly as large as the Shortnose Sturgeon referred to.

The Draft Permit specifies that each cooling water intake structure ("CWIS") at CPS must "utilize a curtain wall, traveling screens, spray wash systems and debris return." The intake screens rotate and impinged debris (including aquatic life) are washed off into a trough, which returns organisms to the James River.[145] However, information submitted by Dominion to DEQ in response to a March 4, 2015 DEQ letter and incorporated in the Fact Sheet indicates that the CWIS are inspected "at least once per shift to identify if operation of the backwash and/or travelling capability of the screens is warranted[.]"[146] DEQ should consider requiring more frequent inspection of the CWIS to assess the need for backwash and/or travelling screen operation, especially during months when Atlantic sturgeon are spawning and their larvae are migrating downstream, or during other known anadromous fish migrations in the James River.

Given the presence of Atlantic sturgeon spawning habitat near the CWIS and the October 2015 entrainment and death of two larval Atlantic sturgeon, DEQ should require further measures to reduce flow and associated entrainment. According to Dominion, "[o]perational changes and additional technology requirements are premature until the feasibility, cost and benefits are evaluated in accordance with the 316(b) Rule."[147] We incorporate here by reference

[140] Draft Permit Fact Sheet, Attachment 7.

[141] *Id.*

[142] *Id.*

[143] *Id.*

[144] *Id.*

[145] Draft Permit Fact Sheet, Attachment 7.

[146] *Id.*

[147] *Id.*

the comments of the U.S. Fish and Wildlife Service, submitted on May 7, 2015 and incorporated into the Fact Sheet, urging that the direct and indirect benefits to threatened and endangered species of decreased impingement and entrainment mortality be thoroughly accounted for in any cost and benefit studies. These include the Comprehensive Cost and Technology Study, the Benefits Valuation Study, and the Non-water Quality and Other Impacts Study.

Even without further study being completed, and based on the already-documented entrainment of Atlantic sturgeon larvae, it is clear that the existing technology the CPS is inadequate and must be enhanced. In comments submitted to DEQ regarding the CWIS at Appalachian Power Company's Clinch River Plant, the U.S. Fish and Wildlife Service stated that, in order to protect federally listed species in Virginia, a 1.0-millimeter intake screen mesh size and actual through-screen velocity of no more than 0.25 fps are recommended.[148] Currently, intake screen mesh size at CPS is currently 3/8- inch, or 9.5 millimeters, and through-screen velocity at the five CPS CWIS are either 1.2 or 1.7 fps. At a minimum, the CPS intake should follow the Fish and Wildlife Service's recommendations for protecting federally listed species in Virginia.

The Draft Permit specifies that Dominion shall submit to DEQ, no later than 270 days prior to the expiration date of the permit, "all applicable information described in 40 CFR § 122.21(r)."[149] Instead of waiting until the next permit reissuance to collect the information required by the Rule, DEQ should require Dominion to submit studies as they are completed, so that this information may be assessed by the public in advance of the next permit cycle. In addition, DEQ should in *this* permit reissuance require Dominion to combine the impingement reduction technologies in place with flow reduction (in terms of volume and through-screen velocity) to further reduce impingement and entrainment. Reduction of through-screen velocity and/or intake volume, or operation of a closed-cycle recirculating system, would all significantly reduce impingement/entrainment and associated mortality.

I. The Draft Permit Fails to Comply with Virginia's Tier 1 Antidegradation Policy.

The Draft Permit does not comply with Virginia's Antidegradation Policy, which—with respect to "Tier 1 waters"—provides as follows:

> As a minimum, existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.[150]

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[148] Letter from U.S. Fish and Wildlife Service, Virginia Field Office, to Mark Trent, Virginia Department of Environmental Quality, Southwest Regional Office, Re: Appalachian Power Company Clinch River Plant (VPDES VA0001015) 316(b) Coordination, Russell County, VA, Project # 2015-I-2237, at p. 3 (July 16, 2015).

[149] Draft Permit, Part I.D.3.

[150] 9VAC25-260-30.A.1.

The draft fact sheet summarizes the antidegradation analysis on Pages 8-9. DEQ determined that the James River and Farrar Gut are Tier 1 waters, such that the level of water quality to protect the existing uses shall be maintained and protected. Nevertheless, the draft permit substantially and negatively impacts existing uses.

The extremely hot wastewater represents a hazard to humans who may come in contact with the water. Outfall 003, for example, has discharged water as hot as 129º F, while Outfalls 001 and 002 have discharged at temperatures as high as 120º F and 128º F, respectively. Visitors to Dutch Gap use both of the areas surrounding these outfalls for recreational purposes, including boating, fishing, and nature viewing, and even swimming. These temperatures are hot enough to cause scald burns in humans, especially in children whose skin is more susceptible to burning.[151]

J. VDEQ Should Require Groundwater Monitoring Under the VPDES Permit.

A groundwater monitoring plan, approved October 5, 2001, is an enforceable part of the permit. The 2004 permit required the utility to submit a corrective action plan (CAP), to address groundwater contamination associated with the "Old Ash Pond."

The CAP identified several "Constituents of Possible Concern" in the Old Ash pond, including arsenic, cadmium, iron, manganese, and molybdenum. Designation as a Constituent of Possible Concern means that concentrations for these parameters were found higher than EPA Regional Screening levels for tap water (T-RSLs) or National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs). In addition, several pollutants were found have increased significantly above background concentrations in the Old Ash pond, including arsenic, barium, copper, iron, manganese, molybdenum, ammonia, and chloride. Arsenic was found at 1000 times the EPA-listed T-RSL in 2013. Furthermore, manganese has been recorded at 270 times the groundwater standard, and iron at 318.3 times the standard.

There is also groundwater contamination associated with the "New Ash Pond." Quarterly groundwater testing from 2004 to 2015 for the New Ash pond showed that cadmium has been leaching since 2004. Cadmium has been detected in three different wells and has exceeded state groundwater standards. Furthermore, sulfate has been reported at 11 times the groundwater standard and ammonia has also been reported above background levels for the past ten years.

Surface water testing in Aiken Swamp and Farrar Gut for the CAP submitted in 2007 and 2012 showed arsenic, barium, chromium, copper, iron, manganese, molybdenum, vanadium, zinc, ammonia, chloride, and sulfate above the relevant background concentrations. Testing further showed iron and manganese in Farrar Gut above the relevant Virginia Water Quality Standards for public water supply, and hexavalent chromium in the surface water in Farrar Gut above the Virginia Water Quality Standards for Aquatic Life. Certain constituents, such as arsenic, are bioaccumulative, and may pose a risk over time to aquatic life even if not detected at

[151] Attachment 42, Shields et al., *Still too hot: Examination of water temperature and water heater characteristics 24 years after manufacturers adopt voluntary temperature setting*, 34 J. Burn Care Res. 281-87 (Mar. 2014).

levels above standards.[152] Given the recreational and aquatic life uses of Farrar Gut, including fish consumption, these results raise concerns.

Groundwater at the site flows radially away from the Old Ash Pond, which is bordered by Farrar Gut and Aiken Swamp. Groundwater at the site may be causing impacts to surface waters, as indicated by the Groundwater Quality and Risk Assessment Report – Phase I. Given that the current closure plans allow the ash storage facilities to remain unlined, it is possible that pollution of groundwater and subsequent pollution of the surface water by that groundwater will continue post-closure. DEQ should require a comprehensive assessment of corrective action alternatives and their efficacy *before* allowing closure of the Upper Ash Pond and Lower Ash Pond to proceed. This will likely require additional groundwater monitoring data. No permits authorizing closure should be granted until these issues regarding effective corrective action are fully assessed and resolved.

K. VDEQ Must Consider Sea Level Rise and Flooding Risk.

According to FEMA flood maps, the Lower Ash Pond has a 1% annual chance of flood hazard.[153] The effects of rising seas will exacerbate the problem and increase risk of flooding.[154] VDEQ has not evaluated the increased risk of flooding at the CPS, and should take such factors in consideration.

III. CONCLUSION

In closing, the proposed Draft Permit does not conform to applicable legal requirements and is based on insufficient information. As a result, we respectfully request that DEQ withdraw the draft permit, revise it to address the identified flaws, and thereafter reissue a revised draft permit and provide a complete fact sheet for public comment. In the alternative, we respectfully request that DEQ substantially revise the proposed permit in response to these comments.

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[152] *See* Attachment 43, L. Ruhl, et al., *The Impact of Coal Combustion Residue Effluent on Water Resources: A North Carolina Example*, 46(21) Envt'l. Sci. & Tech. 12226 (Sept. 30, 2012).

[153] Attachment 44, FEMA's National Flood Hazard Layer. The area in blue represents 1-percent annual chance flood hazard.

[154] Attachment 45, Recurrent Flooding Study for Tidewater Virginia, Virginia Institute of Marine Science, (Jan. 2013).

Thank you for your consideration of these comments.

Sincerely,

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Encls:
See Appendix

APPENDIX

Attachment	Title / Description
1	National Park Service, U.S. Dep't of the Interior, Making the Trail Visible and Visitor Ready: Progress on the James River Segment (Dec. 2013).
2	Chesterfield County, Parks and Recreation, Nature Programs - Dutch Gap (available at http://www.chesterfield.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=16214&libID=16207)
3	Chesterfield County, Parks and Recreation, Dutch Gap Conservation Area - Outdoor Programs (available at http://www.chesterfield.gov/DutchGap)
4	Chesterfield County, Parks and Recreation, Dutch Gap Conservation Area & Dutch Gap Boat Landing Map (available at http://www.chesterfield.gov/ WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=6442483670&libID=6442483670)
5	Black Dog Paddle website (available at http://blackdogpaddle.com/index.html)
6	Mark Fausz, *Health concerns around Dominion flyash permit*, Village News Online (July 13, 2016)
7	Hunter Reardon, *Out of the Depths*, Richmond Magazine (Feb. 26, 2014) (available at http://richmondmagazine.com/news/features/out-of-the-depths-02-26-2014/)
8	Hopewell Virginia System, Virginia American Water (available at http://www.amwater.com/vaaw/about-us/hopewell-water/index.html)
9	James River Association, Chesterfield Power Station
10	Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region, 77 Fed. Reg. 5880 (Feb. 6, 2012)
11	Endangered Species Act Section 7 Consultation: Programmatic Biological Opinion on the U.S. Environmental Protection Agency's Issuance and Implementation of the Final Regulations, Section 316(b) of the Clean Water Act, Appendix C: Additional Species Specific Effects Analysis for Species Under Jurisdiction of NMFS
12	Designation of Critical Habitat for the Gulf of Maine, New York Bight, and Chesapeake Bay Distinct Population Segments of Atlantic Sturgeon, 81 Fed. Reg. 35,701 (proposed June 3, 2016)
13	M. Balazik et al., *Empirical Evidence of Fall Spawning by Atlantic Sturgeon in the James River, Virginia*, Transactions of the American Fisheries Society, 141:6, 1465-71 (Oct. 1, 2012)
14	M. Balazik & J. Musick, *Dual Annual Spawning Races in Atlantic Sturgeon*, PLOS One (May 28, 2015)
15	R. Springston, *12-foot sturgeons possible in James River, scientist says*, Richmond Times-Dispatch (Sept. 28, 2013)

Attachment	Title / Description
16	M. Balazik et al., *The Potential for Vessel Interactions with Adult Atlantic Sturgeon in the James River, Virginia*, N. Am. J. of Fisheries Mgmt. 32:1062-69 (Oct. 15, 2012)
17	D. M. Bilkovic et al., *Atlantic Sturgeon Spawning Habitat on the James River, Virginia*, Final Report to NOAA / NOAA Chesapeake Bay Office, Virginia Institute of Marine Science, Center for Coastal Resources Management (Feb. 2009)
18	Atlantic Sturgeon (Ch. 8), *Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs*, Atlantic States Marine Fisheries Commission (Jan. 2009)
19	Atlantic sturgeon Habitat Addendum, Atlantic States Marine Fisheries Commission (Sept. 2012)
20	M. Balazik, *Life History Analysis of James River Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) with Implications for Management and Recovery of the Species*, Virginia Commonwealth University (2012)
21	J.A. Musick, *Essential Fish Habitat of Atlantic Sturgeon Acipenser oxyrinchus in the Southern Chesapeake Bay*, Final Report to NOAA/NMFS, VIMS Special Scientific Report #145 (Nov. 5, 2005)
22	D. H. Secor and T. E. Gunderson, *Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon*, Acipenser oxyrinchus, Fishery Bulletin 96(3) (1998)
23	Atlantic sturgeon Fact Sheet, Atlantic States Marine Fisheries Commission (available at http://www.asmfc.org/files/Habitat/Species%20factsheets/AtlanticSturgeon.pdf)
24	U.S. Geological Survey, The USGS Water Science School – Water properties: Dissolved oxygen (available at http://water.usgs.gov/edu/dissolvedoxygen.html)
25	Office of Water, U.S. EPA, *Volunteer Stream Monitoring: A Methods Manual 5.2*, EPA 841-B-976-003 (1997) (available at https://www.epa.gov/sites/production/files/2015-06/documents/stream.pdf)
26	National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities, 79 Fed. Reg. 48,300 (Aug. 15, 2014)
27	Email from C. Linderman to B. Trulear re: 316(b) Annual Reporting to the Services (May 13, 2016) with attached spreadsheet
28	Jerre Mohler, *Culture Manual for the Atlantic Sturgeon*, U.S. Fish & Wildlife Service (2003)
29	U.S. EPA, NPDES Permit Writer's Manual (Sept. 2010)
30	Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 80 Fed. Reg. 67,838 (Nov. 3, 2015)

Attachment	Title / Description
31	Letter from M. Nuhfer, Chief, Municipal & Industrial NPDES Section, EPA Region 4 to J. Poupart, Chief, Permitting Section, Division of Water Quality, North Carolina Department of Environment & Natural Resources (Sep. 16, 2014)
32	N.C. Dep't of Envtl. Quality, Fact Sheet for the NPDES Permit Development for Riverbend Steam Station, NPDES No. NC0004961 (May 21, 2014) (available at http://edocs.deq.nc.gov/WaterResources/0/doc/266377/Page1.aspx)
33	N.C. Dep't of Envt'l. Quality, Final Permit for Riverbend Steam Station, NPDES Permit No. NC0004961 (available at http://portal.ncdenr.org/c/document_library/get_file?p_l_id=1169848&folderId=1837865&name=DLFE-122176.pdf)
34	Report of Randall Grachek, Evaluation of Permit Requirements for Wastewater Discharge from Coal Ash Pond Closure - Dominion Power Company, Chesterfield Power Station (July 21, 2016)
35	Weekly Water Testing Results, Bremo Power Station
36	Weekly Water Testing Results, Possum Point Power Station
37	Guidance Memo No. 00-2011, Guidance on Preparing VPDES Permit Limits
38	VDEQ, TMDL Guidance Memo No. 09-2001 (Mar. 6, 2009)
39	VDEQ, TMDL Guidance Memo No. 09-2001, Amendment No. 1 (Nov. 1, 2011)
40	Photographs taken by Jamie Brunkow, James River Association at Farrar Gut (Oct. 24, 2014 – Apr. 5, 2016)
41	Hydroqual Study and Other Documents in Support of Thermal Variance (2003)
42	Shields et al., Still too hot: Examination of water temperature and water heater characteristics 24 years after manufacturers adopt voluntary temperature setting, 34 J. Burn Care Res. 281-87 (Mar. 2014)
43	L. Ruhl, et al., The Impact of Coal Combustion Residue Effluent on Water Resources: A North Carolina Example, 46(21) Envt'l. Sci. & Tech. 12226 (Sept. 30, 2012)
44	FEMA's National Flood Hazard Layer (available at http://www.arcgis.com/home/webmap/viewer.html?webmap=cbe088e7c8704464aa0fc34eb99e7f30&extent=-77.4062,37.3532,-77.3436,37.3821)
45	Recurrent Flooding Study for Tidewater Virginia, Virginia Institute of Marine Science, (Jan. 2013)
46	F.J. Dwyer, et al., *Assessing Contaminant Sensitivity of American Shad, Atlantic Sturgeon and Shortnose Sturgeon*, U.S. Geological Survey, Columbia Environmental Research Center (2000)
47	F.J. Dwyer, et al., *Assessing Contaminant Sensitivity of Endangered and Threatened Aquatic Species: Part III. Effluent Toxicity Tests*, Arch. Envt'l Contam. Toxicol. 48, 174-83 (2005)

Attachment	Title / Description
48	S.J. Te, et al., *Bioaccumulation and chronic toxicity of dietary L-selenomethonine in juvenile white sturgeon, Acipenser transmontanus*, Aquatic Toxicology (Nov. 2006)
49	S. Heidary, et al., *Bioaccumulation of heavy metals Cu, Zn, and Hg in muscles and liver of the stellate sturgeon in the Caspian Sea and their correlation with growth parameters,* Iranian J. of Fisheries Sciences (Nov. 2011)
50	NOAA's National Marine Fisheries Service, Endangered Species Act Section 7 Consultation, Biological Opinion (Apr. 10, 2013)
51	Letter from U.S. Fish and Wildlife Service, Virginia Field Office, to Mark Trent, Virginia Department of Environmental Quality, Southwest Regional Office, Re: Appalachian Power Company Clinch River Plant (VPDES VA0001015) 316(b) Coordination, Russell County, VA, Project # 2015-I-2237, at p. 3 (July 16, 2015)
52	R. Stewart, et al., *Horizontal cooling towers: riverine ecosystem services and the fate of thermoelectric heat in the contemporary Northeast US*, IOP Publishing, Envt'l Res. Letter 8 (2013)